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THRESHOLD TEST BAN AND PEACEFUL NUCLEAR EXPLOSIONS TREATIES

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Mr. PELL, from the Committee on Foreign Relations, submitted the following

REPORT

together with

ADDITIONAL VIEWS

[To accompany Ex. N, 94-2]

The Committee on Foreign Relations, to which was referred two treaties between the United States of America and the Union of Soviet Socialist Republics on (1) the Limitation of Underground Weapon Tests, and the Protocol thereto, signed in Moscow on July 3, 1974, and (2) Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto, signed in Washington and Moscow on May 28, 1976, having considered the same, reports favorably thereon with reservations and declarations and recommends that the Senate give its advice and consent to ratification thereof.

I. PURPOSE AND SUMMARY OF THE TREATIES

PURPOSE

The treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests, and the Protocol thereto, referred to as the Threshold Test Ban Treaty (TTB Treaty), and the treaty between the United States of America and the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto (PNE Treaty), taken together, will govern the conduct of all underground nuclear explosions by the Parties, those for weapon tests as well as those for peaceful purposes. All

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nuclear explosions other than underground nuclear explosions are prohibited by the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (the Limited Test Ban Treaty), which entered into force in 1963.

The TTB Treaty and the PNE Treaty are closely interrelated. The TTB Treaty imposes a yield limitation and other conditions on underground nuclear weapon tests, while the PNE Treaty imposes the identical yield limitation on individual underground nuclear explosions for peaceful purposes and other limitations and conditions on the conduct of underground nuclear explosions for peaceful purposes. The PNE Treaty was negotiated pursuant to Article VIII of the TTB Treaty which provides that the United States and the Soviet Union will negotiate and conclude an agreement governing underground nuclear explosions for peaceful purposes. The two treaties are expressly linked to each other by a number of provisions, including the entry-into-force provision of the PNE Treaty, which provides for the simultaneous exchange of instruments of ratification of both treaties.

The TTB Treaty and the PNE Treaty also introduce new concepts to strengthen and improve the verification process. While the Limited Test Ban Treaty is verified by National Technical Means, the TTB and PNE Treaties add requirements for exchange of specific information in advance to assist verification by national technical means, and the PNE Treaty establishes procedures for on-site observation under certain conditions on the territory of the Party conducting the explosion.

SUMMARY OF TTB TREATY

The TTB Treaty, including a Protocol which is an integral part thereof, was signed in Moscow on July 3, 1974.

The treaty provides for both a limitation of 150 kilotons on all underground nuclear weapon tests carried out by the Parties and for the exchange of data to ensure verification of compliance by national technical means. The treaty consists of a preamble, five operative articles, and a Protocol.

SUMMARY OF PNE TREATY

The PNE Treaty, including a Protocol which is an integral part thereof, was signed in Washington and Moscow on May 28, 1976. An associated Agreed Statement dated May 13, 1976 concerning the treaty was initialed in Moscow, and is included as an attachment to the text of the treaty.

This treaty, which was negotiated pursuant to Article III of the TTB Treaty, establishes procedures for the conduct of undergound nuclear explosions for peaceful purposes (PNE's), designed to meet the three basic criteria considered essential by the Ford administration for an acceptable agreement:

(1) Underground nuclear explosions for peaceful purposes must not provide weapon-related benefits otherwise precluded by the TTB Treaty;

(2) The fact that PNE activities are not contributing to such benefits must be adequately verifiable; and

(3) The PNE Treaty must be consistent with existing treaty obligations, including, in particular, the Limited Test Ban Treaty.

Negotiation of the PNE Treaty was necessitated by the expressed Soviet interest in providing for a program of underground nuclear explosions for peaceful purposes and the concomitant U.S. desire to obtain effective limitations on nuclear weapon tests. The PNE Treaty is designed to ensure that weapon-related benefits otherwise precluded by the TTB Treaty cannot be obtained by a Party in the course of a PNE program whether the explosions are carried out on its own territory or on the territory of a third state pursuant to an arrangement for providing PNE services to such a third state.

The treaty was negotiated specifically to provide a regime for the conduct of PNE's by nuclear weapons states and it in no way alters the fact that acquisition of a nuclear explosive capability, albeit for ostensibly peaceful purposes, by a non-nuclear weapon state would inevitably mean the simultaneous acquisition of a nuclear weapons capability.

The PNE Treaty provides for a limitation of 150 kilotons on all individual underground nuclear explosions for peaceful purposes and for an aggregate yield limitation of 1.5 megatons on group nuclear explosions for such purposes. A group explosion consists of substantially simultaneous individual explosions located within a specified geometrical relationship to one another.

The treaty provides for mandatory on-site observer rights for monitoring such group explosions with an aggregate yield greater than 150 kilotons to verify that the yield of no individual explosion exceeds 150 kilotons and that the explosions serve the stated peaceful purposes. The treaty also provides for on-site observer rights for explosions with an aggregate yield between 100 and 150 kilotons if both Parties agree that, on the basis of information provided, the presence of such observers would be appropriate for the confirmation of the yield of the explosion. The treaty consists of a Preamble, nine operative articles, and a Protocol.

II. BACKGROUND

Following the development of atomic weapons in the early 1940's and their first and only use in 1945 at Hiroshima and Nagasaki, the post-war years were marked by a race between the United States and the Soviet Union to develop, test, and deploy atomic and, later, hydrogen weapons. In the 1950's, Britain and France moved toward creation of their own independent arsenals. Early efforts to turn away from nuclear weapons entirely came to naught, but, under preessure from other nations, the United States, Great Britain, and the Soviet Union, did agree to discuss a comprehensive ban, and a voluntary moratorium on testing came into place in 1958. Although President Eisenhower announced in 1959 that the United States would no longer be bound, and although the French tested, the tripartite moratorium lasted until 1961, when the Soviets tested and the United States tested 2 weeks later.

Discussions in that period focussed on the concept of a complete ban, but the United States and the Soviet Union could not resolve their differences on various significant matters, including the numbers of annual, on-site inspections and the numbers of control posts and unmanned seismic stations.

LIMITED TEST BAN TREATY OF 1963

By mid-1963, however, it was clear that an agreement might be achievable which did not deal with underground tests, but banned other testing. Accordingly, three power meetings began on July 15, and a treaty, the Limited Test Ban Treaty, was negotiated in 10 days. It prohibits any nuclear weapon test explosion, or any other nuclear explosion by the parties, in the atmosphere, in outer space, and under water. The treaty allows nuclear explosions underground, but only if there will be no radioactive debris outside the territorial limits of the nation conducting the explosion.

The treaty was signed in Moscow on August 5, 1963. On September 24, after extensive hearings and almost 3 weeks of debate, the Senate consented to ratification in an 80–19 vote. President Kennedy ratified the treaty on October 7, and it entered into force on October 10.

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THRESHOLD TEST BAN AND PEACEFUL NUCLEAR EXPLOSIONS TREATIES

In 1974, President Nixon signed the Threshold Test Ban Treaty (TTBT), which applied further limits on nuclear testing by restricting underground nuclear weapons tests to an explosive yield of 150 kilotons. However, the specified entry into force was delayed until March 31, 1976, and the treaty was not submitted to the Senate by the President pending negotiation of a companion treaty covering peaceful nuclear explosions. The Peaceful Nuclear Explosions Treaty (PNET) was signed by President Ford in 1976, and he transmitted the two treaties to the Senate late in his term.

In 1977, the Foreign Relations Committee held hearings and, by unanimous vote, ordered the TTB and PNE Treaties reported favorably, but reporting was delayed pending completion of action on and reporting of the Panana Canal Treaties so the two testing treaties would not precede the Panama treaties on the calendar. In mid-1978, the Administration concluded that a push to gain Senate consent to ratification of the TTBT and PNET could stir up a fight which would jeopardize the prospects for a complete ban. Accordingly, the committee voted to reconsider the vote of approval and to return the treaties to the committee calendar.

Citing customary international law, both sides have committed themselves to observance of the TTB/PNE Treaties for the last decade, although the Reagan administration has reported to Congress that the Soviets have "likely" exceeded the 150 kiloton ceiling on numerous occasions. This contention is disputed by scientists and others who question the accuracy and the interpretation of the Administration's yield measurements.

Since the agreements have not been ratified, two important provisions related to verification have not been implemented: (1) provisions under the PNET for on-site monitoring of pre-announced groups of nuclear explosions with an aggregate yield above 150 kilotons; and (2) exchange of data and test calibration information under both treaties that would improve each side's verification confidence level, unless undercut by deception.

COMPREHENSIVE TEST BAN

During the Carter administration the United States, the Soviet Union, and the United Kingdom conducted lengthy negotiations on a CTB. By 1979, almost all issues had been resolved or appeared resolvable. The sides were moving toward agreement that weapons tests would be banned and that a moratorium would be placed indefinitely on so-called peaceful nuclear explosions.

Verification was to be both through international arrangements specified in the treaty and special arrangements among the United States, the Soviet Union, and the United Kingdom. The treaty provided for verification by National Technical Means (NTM), as well as an international exchange of seismic data. Any participant could request an on-site inspection of a suspicious event, which could either be granted or the event could be explained. In the case of the original three parties, it was agreed that ten stations would be located in both the Soviet Union and the United States. The number of seismic stations to be placed in Britain was not resolved. The three countries could also request inspections that would have to be granted unless explanations were provided. Denials of inspection demands would have to be taken into account in assessing a party's compliance record.

In a major effort to gain JCS, DOD, and DOE support for the emerging treaty, President Carter shortened the proposed initial duration of the treaty from 5 to 3 years, thereby reducing the period of time during which the United States would not be able to conduct reliability or developmental testing for its nuclear weapons programs. After heated dispute, a decision was made that the treaty should automatically expire at the end of 3 years unless renegotiated. Differences within the government were never resolved as to whether the United States should only retain the option to resume testing or should commit itself in advance to renewed testing. In 1979 and 1980, the test ban issue was overshadowed by SALT. The test ban negotiations continued at a low level pending the outcome of SALT II ratification until the end of the Carter administration.

THE REAGAN ADMINISTRATION POSITION

Reversing the position of previous administrations, the Reagan administration decided in 1981 not to resume the tripartite CTB negotiations. ACDA Director Rostow declared that, while a CTB would remain a "long-term objective" of the United States, the verification problems associated with such an accord were probably insurmountable in the near term. Subsequently, it became clear that verification was not the only Administration concern.

Last year, the Administration set forth its list of conditions which must be met before it is willing to enter into direct negotiations on a CTB. On May 8, Assistant Secretary of State H. Allen Holmes told the committee:

> A complete cessation of nuclear tests must be viewed in its relationship to the entire strategic situation. As we have stated often, a CTB remains a long-term objective of the United States in the context of achieving broad, deep, and verifiable arms reduction, substantially improved verification capabilities, expanded confidence building measures, and greater balance in conventional forces, and at a time when a nuclear deterrent is no longer as essential an element as currently for international security and stability.

With regard to the TTBT and PNET, the Reagan administration, after extended review, decided in June 1982 that no ratification was possible unless the Soviets agreed to expanded TTBT provisions on verification. Until last summer, the Soviets rejected U.S. requests for discussions on expanded provisions, arguing that any discussion of new provisions should follow, and not precede, ratification. A series of three sessions of test ban meetings occured in recent months in Geneva, but it was clear the two sides had conflicting purposes—the U.S. side wanted to deal with verification proposals and the Soviets wanted to talk about a complete ban.

As President Reagan left for Reykjavik summit last fall, a conference committee was considering different nuclear testing provisions contained in each chamber's version of the Defense Authorization bill. The House provision would have bound the United States to a 1-year moratorium on nuclear tests over one kiloton under certain conditions. The Senate's version, offered by Senators Kennedy and Mathias, was non-binding, calling for ratification of the TTBT and PNET and resumption of talks on a Comprehensive Test Ban (CTB). The Kennedy-Mathias amendment also invited the President to submit any reservation he believed necessary for ratification of these treaties. The Administration opposed both measures, but preferred the Senate version.

To break the impasse on the Defense bill and to leave the President free to deal with General Secretary Gorbachev, a compromise was reached. The Congress accepted the Senate provision in exchange for Presidential assurances which were contained in an October 10 letter from President Reagan to Chairmen Goldwater and Aspin. The President agreed as follows:

> To take two important steps toward limiting nuclear testing. First, I intend to inform General Secretary Gorbachev in Reykjavik that as a first order of business for the 100th Congress, if the Soviet Union will, prior to the initiation of ratification proceedings in the Senate next year, agree to essential TTBT/PNET verification procedures which could be submitted to the Senate for its consideration in the form of a protocol or other appropriate codicil, I will request the advice and consent of the Senate to ratification of the TTB and PNE treaties. However, if the Soviet Union fails to agree to the required package of essential procedures prior to the convening of the 100th Congress, I will

> still make ratification of these treaties a first order of business for the Congress, with an appropriate reservation to the treaties that would ensure they would not take effect until they are effectively verifiable. I will work with the Senate in drafting this reservation.
>
> Second, I intend to inform the General Secretary in Reykjavik that, once our verification concerns have been satisfied and the treaties have been ratified, I will propose that the United States and the Soviet Union immediately engage in negotiations on ways to implement a step-by-step parallel program—in association with a program to reduce and ultimately eliminate all nuclear weapons—of limiting and ultimately ending nuclear testing.

III. COMMITTEE ACTION

On January 13, 1987, the President communicated with the Senate to ask that "the Senate consider these important treaties anew in light of developments that have taken place over the last decade."

Accordingly, the committee held hearings on January 13 and 15. Witnesses at the first open hearing included the Honorable H. Allen Holmes, Assistant Secretary of State for Politico-Military Affairs; the Honorable Robert B. Barker, Assistant to the Secretary of Defense (Atomic Energy); Lieutenant General Dale A. Vesser, USA, Director for Strategic Plans and Policy (J-5), Joint Chiefs of Staff; Admiral Sylvester R. Foley, Assistant Secretary for Defense Programs, Department of Energy; and Dr. James H. McNally, Deputy Assistant Director, Bureau of Verification and Intelligence, Arms Control and Disarmament Agency. Dr. Barker, representatives of the intelligence community, and the directors of the two nuclear laboratories testified in subsequent closed session. Witnesses at the second open session included Dr. Roger Batzel, Director, Lawrence Livermore National Laboratories; Dr. Siegfried S. Hecker, Director, Los Alamos National Laboratories; The Honorable William Colby, former Director, Central Intelligence Agency; Dr. Wolfgang K.H. Panofsky, Director Emeritus, Stanford Linear Accelerator Center Professor, Stanford University; Dr. Milo D. Nordyke, Leader, Treaty Verification Research Program, Lawrence Livermore National Laboratories, and Professor Paul G. Richards, Lamont-Doherty Geological Laboratory, Columbia University.

In anticipation of early action on the treaties, Senator Pell asked the Majority and Minority staffs to work with Administration representatives to see if language could be developed for a draft reservation to be developed as an option for the committee's consideration. Progress was made in a series of meetings on various issues, but Administration representatives and some staff members remained in complete disagreement over the wisdom and feasibility of a concept devised by the Administration involving a cumbersome dual ratification process.

A number of Members were disappointed by the Administration's decision to recommend dual ratification as reflected in the proposed language for a condition requested in the President's letter:

> The Senate's Resolution of advice and consent to ratification is subject to the condition that the President shall not proceed with ratification of the Treaty on the Limitation of Underground Nuclear Weapons Tests and the Treaty on Limitation of Underground Nuclear Explosions for Peaceful Purposes until the President has certified to the Senate that the Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty on Limitation of Underground Weapons Tests, and including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations so that the limitations and obligations of these treaties, inter alia the 150-kiloton limit, are effectively verifiable, and until such agreements have been submitted to the Senate, and the Senate has advised and consented to their ratification.

Following the hearings, a number of Senators suggested to the Administration that it should suffice to have the Senate give its advice and consent with the requirement that ratification not occur until the President certified to the Senate that he had achieved the additional agreements. The argument was advanced that, under such circumstances, a second vote was not needed, and, if required, would make the first vote essentially meaningless. Moreover, some Senators asserted, such an unprecedented procedure was completely inconsistent with the President's October 10 commitment and represented a refusal by the Administration to act in good faith.

Although the President agreed to review the dual vote request, the Administration did not respond. Accordingly, at the committee markup on February 19, Senator Pell proposed language for a resolution of approval which includes a reservation as requested by the Administration with the single exception of deleting the phrase providing for a second vote. The reservation, reflecting this deletion, is as follows:

> The advice and consent of the Senate to ratification of the Treaty on the Limitation of Underground Nuclear Weapons Tests is subject to the condition that the President shall not proceed with ratification of this treaty until he has certified to the Senate that the Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty of Limitation of Underground Weapons Tests, including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, so that the limitations and obligations of these treaties, inter alia the 150-kiloton limit, are effectively verifiable.

In addition, Senator Pell proposed that the resolution incorporate the following declaration:

> The Senate declares its support for the President's commitment of October 10, 1986, to propose, upon ratification of the Treaty on the Limitation of Underground Nuclear

Weapons Tests and the Treaty on the Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto, signed in Washington and Moscow on May 28, 1976, and the Agreed Statement thereto, dated May 13, 1976 (EX. N., Ninety-Fourth Congress, second session), immediate negotiations with the Soviet Union on further testing constraints, consistent with the commitment made by each party in Paragraph 2 of Article I of the Treaty on the Limitation of Underground Nuclear Weapons Tests to "limit its underground nuclear weapons tests to a minimum" and the obligation of the two parties in Paragraph 3 of Article I to "continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapons tests."

VERIFICATION TECHNIQUES

The Administration testified that effective verification would require that each side have the right to conduct direct accurate hydrodynamic yield measurements at the site of all nuclear detonations of the other side, which otherwise might have a yield measurement in excess of 150 kilotons. Since the Administration believes that, at present, there is a factor of uncertainty of two in estimating Soviet yields, agreement could be sought for all tests above 75 kilotons, to be subject to hydrodynamic yield measures. This would involve the insertion of a cable in, or parallel to, the hole into which the nuclear device has been inserted.

The Administration believes that its hydrodynamic yield system, known as CORRTEX, reduces levels of uncertainty to 30 percent for higher yield ranges under the threshold level of 150 kilotons. Some experts believe that improvements in recent years in seismology could allow seismologic techniques alone to reduce uncertainties to 70 percent or even less. Thus, the question must be addressed how important the benefits would be of insistence upon broad application of CORRTEX, given its intrusiveness and potential problems of negotiability. At the same time, in view of the possibility of further constraints on testing, careful attention should be given to the development of still more accurate teleseismic methods.

SOVIET COMPLIANCE

In the course of the committee's deliberations, considerable attention was paid to the matter of Soviet compliance with the TTBT and PNET. The Administration has claimed before, and reiterated at the hearings, that the Soviets have been in "likely" violation of the TTBT. A number of questions were also raised by Senator McClure in testimony for the record. In view of the critical importance issue, Senator Pell asked for the comments of Dr. Batzel, who responded as follows:

UNIVERSITY OF CALIFORNIA,
LAWRENCE OF LIVERMORE NATIONAL LABORATORY,
February 23, 1987.

Mr. CLAIBORNE PELL,
Chairman, U.S. Senate, Committee on Foreign Relations, Washington, DC.

DEAR MR. PELL: In response to your letter dated February 20, 1987, enclosed are the comments you requested we submit on the January 15, 1987 testimony of Senator McClure on the 24 Soviet Violations of the Threshold Test Ban Treaty.

Please do not hesitate to contact either myself or Dr. Milo Nordyke, Program Leader of the Treaty Verification Program (415) 422-7365 should you have any questions with this information.

Sincerely,

CARL HAUSSMANN
(For Roger E. Batzel, Director.)

Enclosure.

A VIEW OF SOME ISSUES RELATED TO POTENTIAL SOVIET VIOLATIONS OF THE THRESHOLD TEST BAN TREATY

Assessments of potential Soviet violations of the Threshold Test Ban Treaty involve statistical analyses of various lines of evidence, the strongest of which is derived from seismic data. Based on my Laboratory's analyses of the available data, we have concluded that the Soviets are observing a yield limit. Our best estimate of that limit is that it is consistent with TTBT compliance. However, because of the uncertainties involved we cannot rule out the possibility that a few of the Soviet tests could have exceeded threshold.

These conclusions differ from those presented in the testimony submitted by Senator McClure for several reasons:

1. The actual yields of nuclear devices can differ from their design values. This fact is specifically recognized under the "mistakes" agreement which accompanies the TTBT. In addition, the TTBT negotiating record recognizes the fact that the yield estimates process itself can introduce an additional factor of two uncertainty (for the 95% confidence interval). Thus the existence of estimates of Soviet yields which exceed the 150-kiloton threshold is not de facto evidence that the treaty has been violated.

2. We have based our conclusions on the best available data. These data have higher precision than those presented in the unclassified literature, such as the data from the National Earthquake Information Service (NEIS) and take into account all available information about the Soviet test site. In general, these data show that both the number and the size of the estimated Soviet yields which appear to exceed 150 kilotons are smaller than those shown in the unclassified chart provided by DoD and ACDA.

3. We have taken into account the fact that the data for the U.S. test program show a pattern very similar to that shown by the data for the Soviet test program. This can be

illustrated even by the unclassified data. The attached figure shows NEIS magnitudes from U.S. tests at the Nevada Test Site together with the magnitude level for 150 kilotons shown in the DoD/ACDA chart. Although 12 U.S. tests have magnitudes such that their estimated yields appear to exceed 150 kilotons, none of their actual yields exceeded that level. Thus, the uncertainties in the estimation process give a pattern of estimates greater than 150 kilotons for U.S. tests which is similar to that observed for the Soviets.

4. We have attempted to formally take into account the statistical nature of the compliance evaluation process. The fact that the probability of observing a given estimate is less than 5% if the true yield is 150 kilotons is not equivalent to saying that there is 95% confidence that a Soviet violation has occurred. (Such a statement could be compared to concluding that there is a 95% probability that a coin has no tail if we observe heads on four tosses.)

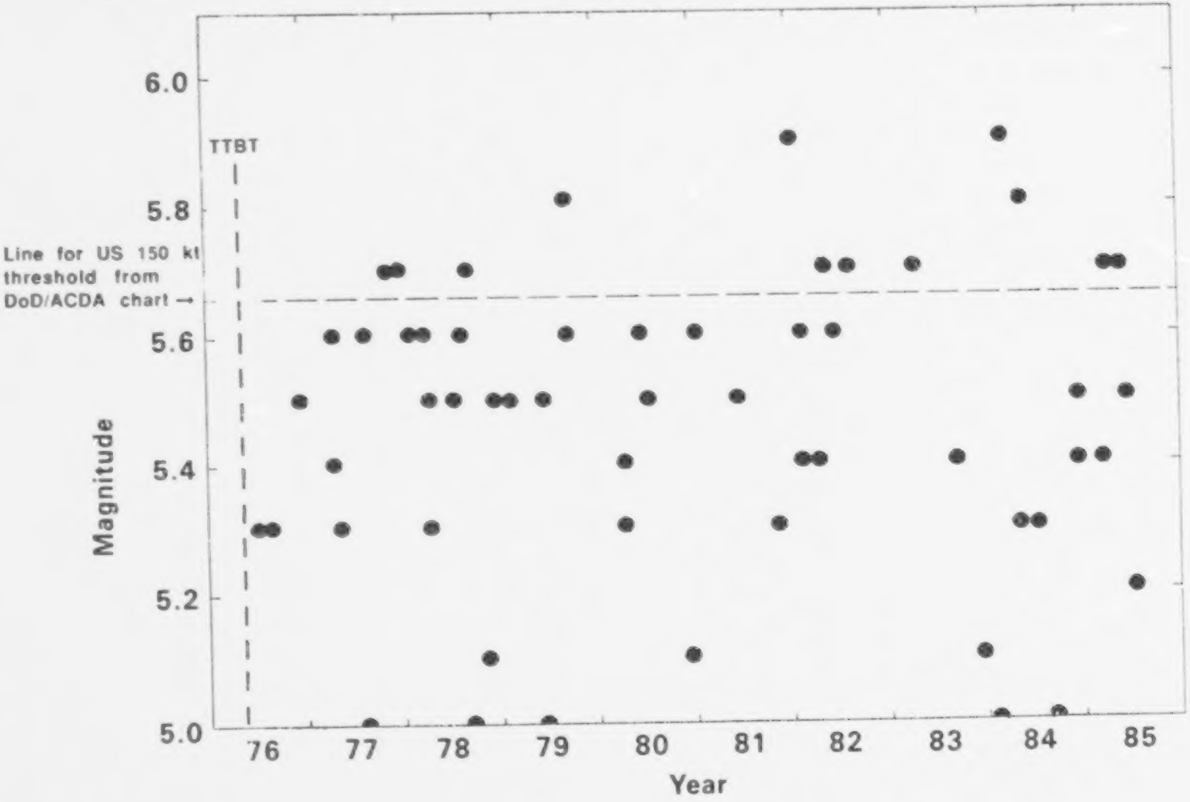
5. We have attempted to place the compliance evaluation process in a setting which reflects not only the distribution of the data and the statistical uncertainty, but also the risks that a determined evader would have to be willing to undertake. For example, if one postulates that an estimated yield of 300 kilotons corresponds to a test with an actual yield of 600 kilotons, one has to argue that the evader was lucky. Not only did he get an outcome which would occur less than 2.5% of the time, he also had to count on avoiding estimates which would be viewed as certain violations. For example, there is a 50% probability that the monitor would estimate that the yield was greater than 600 kilotons.

6. We are aware of three official changes in the magnitude-yield formulation which have been introduced to reflect the evolution of the United State's understanding of the geologic differences between the United States and Soviet test sites. These changes were the result of work which occurred over several years preceding the announcements of the changes. In some cases the work began even before negotiation of the TTBT.

7. The yield estimates for tests at the Shagan River test site do show a drift upward over a period of several years. This change appears more abrupt in the lower-resolution, unclassified data than it does in the higher-resolution classified data. Several plausible explanations have been suggested for this change. These range from changing requirements in weapons systems to ground motion considerations in the city of Semipalatinsk (100 km from the test site) to interpretations of ambiguities in the treaty limitations.

We have considered the non-seismic evidence as well as the seismic evidence. Our conclusion, like that of the DIA panel which also reviewed all of the data, is that the seismic evidence is currently the most reliable basis for estimating the yields of Soviet underground nuclear explosions. We continue to attempt to reconcile the available data. However, we believe that the interpretation of the past Soviet test program which is most consistent with the best available data is that: The Soviets appear to have obeyed a testing limit. The limit is consistent with compliance with the provisions of the TTBT. The uncertainties of the yield estimation process are such that we cannot rule out the possibility that a few of the tests could have exceeded the threshold. These uncertainties are, in part, the source of the differences in the assessments of the extent of Soviet compliance with the TTBT. On-site hydrodynamic yield measurements would help to reduce the uncertainties and improve confidence in the results of the compliance evaluation process.

NEIS magnitudes for NTS events



SAFEGUARDS

A further matter addressed by the committee was a list of safeguards proposed by the Joint Chiefs of Staff. General Vesser indicated to the committee that the support of the Joint Chiefs was tied to adequate verification and the establishment of appropriate safeguards. The committee reviewed the list of proposed safeguards, which draw upon those established in 1963 in connection with consent to ratification of the Threshold Test Ban Treaty. At the Chairman's request, staff members met with representatives of the Joint Chiefs of Staff. Several modifications were proposed to make it clear that the United States would not conduct tests prohibited by the two treaties under consideration or any other treaty, that all essential nuclear test programs foreseeable at present can be conducted under present constraints, that there will be no question of continued compliance so long as the United States is obligated to comply with the treaty. Moreover, it was important to establish, was was done in answers for the record and in discussions at the staff level, that the standards of the safeguards are being essentially met now so far as is practicable and that no major new programs or spending would be required on the basis of establishment of the safeguards.

With the important qualifications understood, the committee concludes that the modified safeguards constitute a valuable guide and should be used in making program and budget decisions. The modified safeguards are as follows:

Safeguard "A"

The conduct, within the constraints of existing treaties on nuclear testing, of comprehensive, and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future.[1]

Safeguard "B"

The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and ensure the continued application of our human scientific resources to those programs on which continued progress in nuclear technology depends.

Safeguard "C"

The maintenance of the basic capability to resume nuclear test programs, in prohibited environments; and to conduct testing promptly in prohibited yield ranges.

Safeguard "D"

In conjunction with a vigorous verification program, the conduct of a comprehensive, and continuing research and development program to improve our monitoring capabilities and operations with a goal of providing high confidence monitoring of those actions from which non-compliance with existing nuclear testing treaties could be inferred.

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[1] For the purpose of Safeguard "A", the underground nuclear test programs shall include, but not be limited to, tests sufficient to insure that our nuclear forces and their supporting command, communications, and intelligence systems are safe, secure, effective, reliable, and survivable, and to advance our understanding of nuclear-weapon effects.

Safeguard "E"

The continuing development of a broad range of intelligence gathering and analytical capabilities and operations to improve our knowledge of the nuclear arsenals, nuclear weapons development programs, related nuclear programs, and the capabilities and achievements of the Soviet Union and other nations.

Safeguard "F"

The conduct of a government review at periodic intervals to determine whether the provisions of existing treaties on nuclear testing remain consistent with U.S national security interests.

The committee discussed the proposed resolutions of ratification in some detail. Upon the motion of the Chairman, with a quorum present and with a majority of the Members physically present voting affirmatively, the committee agreed by separate voice votes to report favorably the resolution of ratification of the Threshold Test Ban Treaty and the resolution of ratification of the Peaceful Nuclear Explosions Treaty. The committee also adopted, by voice vote, a resolution proposed by Senators Kassebaum, Evans and Helms urging the President to conclude negotiations on additional verification measures in 1987.

IV. Committee Comments

In reaching its judgment on the Threshold Test Ban Treaty and the Peaceful Nuclear Explosions Treaty, the committee focussed particular attention on the matter of verification of Soviet compliance. Central to the committee's deliberations were the verification provisions included in the two treaties as negotiated in 1974 and 1976, the value of the required data exchanges and other provisions which would be triggered if the treaties were put into full force and effect, the merits of additional verification provisions if they could be negotiated, and the record of Soviet compliance.

In the more than 10 years in which both sides have committed themselves to respect the treaty limits, a customary practice under international law, questions have been raised as to Soviet compliance. The Administration has reported that the Soviets were in "likely" violation. However, advances in seismic techniques and reevaluations of the data have cast increasing doubt on the validity of any charge of Soviet cheating. The committee was informed by Dr. Batzel that the judgment at the Lawrence Livermore Laboratory is that the Soviets appear to be observing a yield limit consistent with TTBT compliance. As Dr. Nordyke told the committee, "Livermore's best estimate of this yield limit, based on probabilistic assessment, is that it is consistent with TTBT compliance." This view was corroborated by other witnesses. Dr. Panofsky assured the committee that "there exists—and I would like to emphasize this—no persuasive evidence, either from a seismological or from other sources, which indicates that the Soviets have exceeded their threshold." Mr. Colby pointed out that what was viewed in 1976 as adequate verification certainly is much better today and that the evidence is that the Soviets have "essentially complied" with the TTBT, despite arguments whether a few tests were over the limit. Although the possibility exists that a few Soviet tests may have exceeded the limit, it is important to remember that the parties agreed that "one or two slight, unintended breaches a year," while cause for concern and discussion, would not be considered violations.

As detailed earlier, the treaties specify the use of National Technical Means (NTM) of verification and provide that each party shall not interfere with the other side's NTM. In addition, extensive data exchanges are specified. The TTBT requires two calibration shots at each geophysically distinct testing area, and requires that yield, date, time, depth, and coordinates be provided. The PNET is the first agreement controlling nuclear weapons which provides for on-site inspection.

The committee was impressed with the progress made in recent years in developing more accurate assessments of Soviet test activities. This has been accomplished even without the additional information required by the treaties, information that would become available upon ratification. This quantitative data would be both useful and, the committee was told, difficult to falsify. With particular regard to the PNET, data exchanges would significantly improve our understanding of the geophysical properties of the Soviet Union and would be of added value if the sides move toward lower thresholds and a complete ban.

On balance, most committee members conclude that, without ratification, the Untied States has been able to ascertain that the Soviet record has been consistent with compliance and that, with ratification, our abilities to monitor compliance would be improved significantly.

The Administration contends that direct, accurate yield measurement at all appropriate sites of nuclear explosions is crucial to verification of the treaties. Others disagree completely, maintaining that the record indicates that the existing provisions suffice.

On the basis of the evidence, however, most of the committee does not feel justified in concluding that additional verification measures beyond those which would be in place upon ratification are required for adequate verification. The record of the last ten years with regard to Soviet component, and our own efforts to refine compliance assessments, are for most, no cause for alarm. The committee notes that all U.S. national security program objectives have been met while we have complied with the treaties and that, in the area of testing, there is no evidence of any Soviet cheating which produced some illicit benefits.

Moreover, the committee was concerned that the quest for additional verification measures might become a task without end which would protract, if not stall permanently, efforts to get these treaties into full force and effect. As Dr. Panofsky pointed out, the Threshold Test Ban Treaty was thought of as a milestone toward further limits in testing and that "the milestone is becoming a stumbling block if excessive and unjustifiable demands are made for the precision with which this yield is supposed to be determined." In Dr. Panofsky's view, verification reservations would be a bad precedent in lengthening the already tedious arms control decision process further. Mr. Colby, in assessing the Administration's CORRTEX proposal, said that the question must be asked whether we are "going to sacrifice these treaties in order to get some technological gadget in place or are we going to get the benefit of these treaties, knowing that our present systems of verification and what is included in the treaties certainly are adequate to protect our country. That is the problem we have to realize."

At the same time, the committee recognizes that some enhancements in verification could be of value in providing additional evidence regarding Soviet compliance and could further dissuade the Soviets from misconduct. Accordingly, the committee has approved a resolution of ratification which consents to ratification of the two treaties "subject to the condition that the President shall not proceed with ratification of the treaties until he has certified to the Senate that the Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty of Limitation of Underground Weapons Tests, including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, so that the limitations and obligations of these treaties, inter alia the 150-kiloton limit, are effectively verifiable."

In providing for additional agreements, it is the committee's intention to give the Senate's imprimatur to the President's efforts to negotiate on the basis of the present Administration proposal while, at the same time, affording the necessary leeway for the Administration to alter that proposal either unilaterally or in order to reach an acceptable compromise with the Soviets. But the committee intends also to leave leeway for a future President to pursue a different approach, such as the on-site measurement of a small number of specified tests. Thus, it would be quite possible for a negotiation to yield a result which clearly builds upon the obligations contained in Article II of the TTBT to consult, make inquiries, and furnish information in response to such inquiries. The committee believes the adopted formulation will leave the way open for a negotiated solution which could be seen as a validation of the treaty as negotiated, and not, in any sense, a rejection of that earlier effort.

In this connection, the committee was intrigued by the suggestion made by Dr. Nordyke that on-site hydrodynamic yield measurements of the sort the Administration is seeking could be carried out at the sites of the calibration tests. Dr. Nordyke pointed out that on-site inspection of calibration tests alone, such as that provided for in the PNET, would not significantly reduce "random uncertainties" associated with Soviet yield estimates, but would shed considerable light on the validity of seismic methodogy, and help to resolve disagreements about systematic errors between United States and Soviet test sites.

At the request of the committee, Dr. Nordyke elaborated as follows:

> The implementation of an agreement, based on the terms of the PNET Protocol to confirm, with on-site measurements, the hydrodynamic yield of the "two tests for

calibration purposes from each geophysically distinct testing area" of the test sites called for in the TTBT Protocol, would have the following beneficial impact:

(1) It would provide yield estimates for these explosions with an uncertaintly much smaller than that currently attainable with seismic means. These hydrodynamic yield estimates would be used to determine the existence or nonexistence and approximate value of the bias believed to exist between the United States and Soviet test sites. They would hence confirm the validity of the seismic methodology for determining Soviet yields and eliminate the most serious disagreement regarding Soviet yields. They would not, however, significantly reduce the overall random uncertainty of seismic yield estimates. Random uncertainty can be adequately treated with standard statistical procedures. The random uncertainty of seismic estimates can also be significantly reduced by the development of seismic yields based on independent seismic waves.

(2) Such an agreement would also provide a significant on-site presence at the test sites, including an opportunity for confirming geological and geophysical data in the vicinity of the calibration explosion.

(3) Such an agreement would, for the first time, capture in international law the extensive on-site verification provisions of the PNET, as well as assure that many of them, i.e., those relating to hydrodynamic yields, would in fact be implemented.

The committee urges the Administration to seek Soviet agreement to carry out the calibration tests in this way. Such an approach offers obvious advantages and may well be negotiable if both sides wish to have these treaties ratified and to move on to the negotiation of further testing constraints.

The committee believes that a successful negotiation leading to ratification is decidedly in the national security interests of the United States. Once the ratification is accomplished, it is vitally important that the two sides focus their attention and efforts upon further testing constraints.

In his January 13, 1987, letter to the Senate regarding the two treaties, the President said that he had "informed the General Secretary in Reykjavik that, once our verification concerns have been satisfied and the treaties have been ratified, and in association with a program to reduce and ultimately eliminate all nuclear weapons, I would propose that the United States and the Soviet Union immediately engage in negotiations on ways to implement a step-by-step parallel program of limiting and ultimately ending nuclear testing."

In light of this commitment by the President, the committee believes it important to underscore the obligations of the parties in Article I of the TTBT that they shall limit their underground nuclear weapon tests to a minimum and that the parties shall continue their negotiations with a view "toward achieving a solution to the problem of the cessation of all underground nuclear weapons tests."

Accordingly, the committee concludes that action on these treaties should represent a commitment to proceed on an urgent basis to negotiations which could yield further limitations on the size and numbers of nuclear tests, as well as achievement of a complete end to nuclear testing.

V. Section-by-Section Analysis

Each article of the Threshold Test Ban Treaty, each paragraph of the Protocol to the Treaty, and each article of the Peaceful Nuclear Explosions Treaty and the Protocol thereto is described below. The analysis is based upon the text of the article or paragraph, the negotiating history, and relevant commentary. Subject to the provisions of any additional agreements on verification the President may reach with the leader of the Union of Soviet Socialist Republics, the legal obligations the United States would incur by ratifying the TTBT and PNET are set out in this section:

THRESHOLD TEST BAN TREATY

Preamble

The preamble consists of four paragraphs which set forth the common premises and objectives of the Parties.

The first preambular paragraph expresses the intention of the Parties to achieve the cessation of the nuclear arms race at the earliest possible date and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament under strict and effective international control.

The second preambular paragraph recalls the objectives of the Limited Test Ban Treaty to seek to achieve the discontinuance of all underground nuclear weapon tests and to continue negotiations to this end, while the third preambular paragraph notes that the adoption of measures for the further limitation of such tests would contribute to the achievement of these objectives and also to the strengthening of peace and the further relaxation of international tension.

The fourth and final preambular paragraph reaffirms the Parties' adherence to the objectives and the principles of the Limited Test Ban Treaty and the Treaty on the Non-Proliferation of Nuclear Weapons (the Non-Proliferation Treaty).

Article I

Article I of the TTB Treaty consists of three paragraphs. The first paragraph contains an undertaking by each Party to prohibit, to prevent, and not to carry out any underground nuclear weapon tests having a yield exceeding 150 kilotons at any place under its jurisdiction or control, beginning March 31, 1976.

The interrelationship between the TTB Treaty and the PNE Treaty, and in particular, the imposition of identical yield limitations for individual explosions is of considerable significance. During the negotiations of the PNE Treaty, the Parties investigated whether individual underground nuclear explosions for peaceful purposes with yields above 150 kilotons could be accommodated consistent with the agreed aim of not providing weapon-related benefits otherwise precluded by the TTB Treaty. The Parties did not develop a basis for such an accommodation, largely because it has not been possible to distinguish between nuclear explosive device technology as applied for weapon-related purposes and as applied for peaceful purposes. The Parties therefore agreed that the yield limitations on individual explosions in the two Treaties would be the same.

The technical problems associated with a yield threshold were recognized by the sides in the Spring of 1974 during the negotiation of the TTB Treaty. In this context the U.S.S.R. mentioned the idea of some kind of a "mistakes" understanding concerning occasional, minor, unintended breaches. Discussions on the subject of such an understanding took place in the Autumn of 1974 and in the Spring of 1976. The U.S.S.R. was informed by the United States that the understanding reached would be included as part of the public record associated with submitting the TTB Treaty to the Senate for advice and consent to ratification. The entire understanding is as follows:

Both Parties will make every effort to comply fully with all the provisions of the TTB Treaty. However, there are technical uncertainties associated with predicting the precise yield of nuclear weapon tests. These uncertainties may result in slight, unintended breaches of the 150 kiloton threshold. Therefore, the two sides have discussed this problem and agreed that: (1) One or two slight, unintended breaches per year would not be considered a violation of the Treaty; (2) such breaches would be a cause for concern, however, and, at the request of either Party, would be the subject of consultations.

The U.S.S.R. was also informed that while the United States would not consider such a slight, unintentional breach a violation, the United States would carefully review each such breach to insure that it is not part of a general attempt to exceed the confines of the Treaty.

The second paragraph of Article I contains an obligation for each Party to limit the number of its underground nuclear weapon tests to a minimum.

The third paragraph obligates the Parties to continue negotiations aimed at solving the problem of the cessation of all underground nuclear weapon tests. Discussions have been continuing on this subject at the Conference of the Committee on Disarmament in Geneva.

Article II

Article II consists of three paragraphs relating to verification of compliance with the provisions of the TTB Treaty by national technical means. The first two paragraphs are identical to paragraphs 1 and 2 of Article XII of the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems (the ABM Treaty) and paragraphs 1 and 2 of Article V of the Interim Agreement between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms (the Interim Agreement).

Paragraph 1 states that each Party will use national technical means of verification in a manner consistent with generally recognized principles of international law, and paragraph 2 obligates each Party not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1.

Paragraph 3 provides that, in order to promote the objectives and implementation of the Treaty, the Parties shall, as necessary, consult with each other, make inquiries and furnish information in response to such inquiries.

Article III

Article III specifically provides that this Treaty does not apply to underground nuclear explosions for peaceful purposes and provides that the Parties will negotiate an agreement governing such explosions at the earliest possible time. The PNE Treaty, submitted together with this Treaty, is the product of the negotiations conducted pursuant to this Article.

Article IV

Article IV provides that the Treaty is to be ratified in accordance with the constitutional procedures of each Party and is to enter into force on the day of the exchange of instruments of ratification. Because of the interrelationship of the two Treaties, the Parties agreed, in Article IX of the PNE Treaty, that there should be a simultaneous exchange of instruments of ratification of both Treaties.

Article V

Article V consists of three paragraphs. The first paragraph provides that the Treaty shall remain in force for a period of five years unless replaced earlier by an agreement in implementation of paragraph 3 of Article I, which required the Parties to "continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapon tests."

The Treaty shall be extended for successive five-year periods unless either Party notifies the other of its termination no later than six months prior to the expiration of the Treaty.

The second paragraph of Article V permits each Party to withdraw from the TTB Treaty upon six months notice, if such Party decides that its supreme interests have been jeopardized by extraordinary events related to the subject matter of the Treaty. This type of withdrawal clause first appeared in the Limited Test Ban Treaty and has been included in a similar form in most subsequent arms control agreements.

The third paragraph provides that the TTB Treaty wil be registered pursuant to the United Nations Charter.

Protocol to the TTB Treaty

The Protocol to the TTB Treaty consists of five paragraphs, the first three of which provide for the reciprocal exchange of data on the sites of nuclear weapon tests. The fourth paragraph of the Protocol restricts all nuclear weapon tests to specified test sites. The purpose of the data exchange in conjunction with the test site restriction is to assist in the verification by national technical means of compliance with the obligations of the Parties.

Paragraph 1 of the Protocol requires the Parties to exchange the following data:

a. The geographic coordinates of both the boundaries of each test site and the geophysically distinct testing areas within each test site.

b. Information on the geology of the testing areas, namely, the rock characteristics of geological formations and the basic physical properties of the rock.

c. The geographic coordinates of underground nuclear weapon tests, after they have been conducted.

d. Data required for calibration purposes, namely, yield, date, time, depth and coordinates for two nuclear weapon tests from each geophysically distinct testing area where underground nuclear weapon tests have been and are to be conducted. The yield for these two tests is to be as near as possible to the 150 kiloton limit stated in Article I of the Treaty and not less than 1/10 of that limit. For those testing areas for which data on two tests are not available, the data on the second test shall be exchanged as soon as possible after the second test having a yield in the stated range. The Parties are not required to conduct tests solely for calibration purposes.

Paragraph 2 provides for the simultaneous exchange of the data and instruments of ratification, but further states that the Parties shall, on the basis of reciprocity, afford each other the opportunity to familiarize themselves with the data prior to the exchange of instruments of ratification.

Paragraph 3 provides that if a Party should specify a new test site or testing area after the entry into force of the Treaty, the data specified in subparagraphs 1a. and 1b. and, if available, that specified in subparagraph 1d. must be transmitted prior to the use of that site or area. If not available, the data specified in subparagraph 1d. must be transmitted as soon as obtained by the transmitting Party.

Paragraph 4 provides that the test sites of each Party shall be located at places under its jurisdiction or control and that all nuclear weapon tests shall be conducted solely within the testing areas specified in accordance with paragraph 1.

Paragraph 5 provides that, for the purposes of the Treaty, all underground nuclear explosions at the specified test sites shall be considered nuclear weapon tests (even if they are tests related to a program of peaceful nuclear explosions) and shall be subject to the provisions of the Treaty relating to nuclear weapon tests. By contrast the provisions of Article III of the Treaty shall apply to all underground nuclear explosions conducted outside of the specified test sites, and only to such explosions.

Paragraph 5 also provides that the Protocol shall be considered an integral part of the Treaty.

PEACEFUL NUCLEAR EXPLOSIONS TREATY

Preamble

The Preamble to the PNE Treaty contains five paragraphs that set forth the common premises and objectives of the Parties entering into this Treaty.

In the first preambular paragraph the Parties refer to the mandate to negotiate this Treaty set forth in Article III of the TTB Treaty.

In the second preambular paragraph the Parties reaffirm their adherence to the objectives and principles of the Limited Test Ban Treaty, the Non-Proliferation Treaty, and the TTB Treaty, and their determination to observe strictly the provisions of these Treaties.

In the third preambular paragraph the Parties express the desire to assure that underground nuclear explosions for peaceful purposes shall not be used for purposes related to nuclear weapons.

In the fourth preambular paragraph the Parties state their desire that the utilization of nuclear energy be directed only toward peaceful purpsoes.

In the final paragraph of the Preamble, the Parties indicate the desirability of appropriate cooperation in the field of nuclear explosions for peaceful purposes.

Article I

In paragraph 1 of Article I the Parties indicate that they are entering into this Treaty to satisfy the obligations undertaken in Article III of the TTB Treaty and to assume additional obligations in accordance with the provisions of this Treaty.

Paragraph 2 of Article I provides that the PNE Treaty shall govern all underground nuclear explosions for peaceful purposes conducted after March 31, 1976.

Article II

Article II sets forth three definitions to be used for the purposes of the PNE Treaty. The word "explosion" is defined as any individual or group underground nuclear explosion for peaceful purposes and the word "explosive" is defined as any device, mechansim or system for producing an individual explosion. The term "group explosion" is defined as two or more individual explosions for which the time interval between successive individual explosions does not exceed 5 seconds and for which the emplacement points of all explosive can be interconnected by straight-line segments, each of which joins two emplacement points and each of which does not exceed 40 kilometers. This definition was established because teleseismic systems cannot reliably distinguish and measure the yields of individual explosions (in a group) of lesser dimension or shorter time separation.

Article III

In paragraph 1 of Article III, subject to the obligations assumed under this Treaty and other international agreements, each Party reserves the right to carry out nuclear explosions at any place under its jurisdiction or control outside the geographical boundaries of nuclear weapon test sites and to assist in carrying out explosions in the territory of another state, at the request of such state.

Paragraph 2 of article III sets forth the undertaking by each Party not to carry out at any place under its jurisdiction and control or assist in carrying out anywhere individual and group nuclear explosions for peaceful purposes except in compliance with the following yield limitations and stated conditions:

(a) The Parties agree not to carry out or assist in carrying out any individual explosion having a yield exceeding 150 kilotons. Thus, the yield limitation for individual PNEs is identical to that for weapon tests which, as indicated above, resulted from the fact that it has not been possible to develop a basis for assuring that individual explosions with yields greater than 150 kilotons would not provide weapons-related benefits otherwise precluded by the TTB Treaty.

(b) The Parties agree not to carry out or assist in carrying out: (1) any group explosion having an aggregate yield exceeding 150 kilotons except in ways which will permit the identification of each individual explosion and the determination of its yield as provided for in Article IV of and the Protocol to the PNE Treaty; or (2) any group explosion having a yield exceeding one and one-half megatons.

(c) The Parties undertake not to carry out or assist in carrying out any explosion under this provision which does not carry out a peaceful application. In an Agreed Statement associated with this provision the Parties agree that developmental testing of any nuclear explosives (including those intended for peaceful projects) does not constitute a "peaceful application" and any such developmental tests must be carried out only at nuclear weapon test sites pursuant to the TTB Treaty. Thus, the Parties are in accord that the developmental testing of any nuclear explosive must be treated as the testing of a nuclear weapon.

The Agreed Statement also provides that associating facilities, instrumentation or procedures related only to the testing of nuclear weapons or their effects with an explosion carried out pursuant to this Treaty does not constitute a "peaceful application". Therefore, no such test facilities, instrumentation or procedures can be associated with a peaceful nuclear explosion project.

(d) Finally, the Parties agree not to carry out or assist in carrying out any explosion except in compliance with the Limited Test Ban Treaty, the Non-Proliferation Treaty and other international agreements. Some PNE applications that have been contemplated would involve excavation or earth moving operations. This last provision is therefore important because U.S. studies indicate that it does not appear possible to carry out major excavation PNE projects without violating the Limited Test Ban Treaty.

Paragraph 3 provides that, if in the future, either Party believes that individual nuclear explosions having a yield in excess of 150 kilotons could be permitted, this question would be considered by them at an appropriate time which has to be agreed in the future. The negotiating record makes clear that, in order for individual nuclear explosions above the limit of 150 kilotons to be permitted, this Treaty would have to be amended and the amendment submitted to the Senate for advice and consent to ratification.

Article IV

In the first paragraph of Article IV each Party agrees that, for the purpose of providing assurance of compliance with the provisions of the PNE Treaty, they will: (a) use national technical means of verification in a manner consistent with recognized principles of international law as in the TTB Treaty; and (b) provide to the other Party information and access to sites of explosions and furnish assistance, in accordance with the Protocol to the PNE Treaty.

In the second paragraph of this Article the commitment not to interfere is made applicable not only to the utilization of national technical means of verification, as in the TTB Treaty, but also to the implementation of provisions pertaining to information and access to sites and the furnishing of assistance, in accordance with the Protocol to the PNE Treaty.

Article V

Article V provides that the Parties shall promptly establish a Joint Consultative Commission to promote the objectives and implementation of the PNE Treaty. This has a precedent in the provision for the establishment of the Standing Consultative Commission for the SALT ONE agreements in Article XIII of the ABM Treaty and Article VI of the Interim Agreement.

Within the framework of the Joint Consultative Commission (JCC) the Parties will consult with each other, make inquiries and furnish information in response to such inquiries. This is a companion provision to paragraph 3 of Article II of the TTB Treaty.

In the JCC the Parties will also consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous. As with the identical provision in Article XIII of the ABM Treaty and in Article VI of the Interim Agreement, this provision gives the JCC a broad mandate to consider any compliance questions that may be raised by a Party. In addition, the Parties could consider questions involving unintended interference with the means for assuring compliance with this Treaty, which are set forth in paragraph 1 of Article IV.

In the JCC the Parties will also consider changes in technology or other new circumstances having a bearing on this Treaty, as well as possible amendments.

The second paragraph of Article V authorizes the Parties to establish regulations for the JCC governing its procedures, composition and other relevant matters.

Article VI

In the first paragraph of Article VI the Parties agree to develop cooperation on the basis of mutual benefit, equality and reciprocity in fields related to underground nuclear explosions for peaceful purposes. The second paragraph provides that the Joint Consultative Commission will consider specific areas and forms of cooperation, and the third paragraph provides that the Parties will appropriately inform the International Atomic Energy Agency of the results of any such cooperation.

Article VII

In the first paragraph of Article VII the Parties agree to continue to promote the development of the international agreement or agreements and procedures for making available on a non-discriminatory basis potential benefits of peaceful applications of nuclear explosions to non-nuclear-weapon States Parties as provided for in Article V of the Non-Proliferation Treaty and to provide appropriate assistance to the International Atomic Energy Agency in this regard. In the second paragraph of this Article, the Parties undertake not to carry out nuclear explosions for peaceful purposes in the territory of a third state unless such third state agrees to the implementation in its territory of (a) the international observation and procedures envisioned by Article V of the Non-Proliferation Treaty and (b) the provisions of Article IV of the PNE Treaty and the Protocol thereto including the provision by that third State of the necessary assistance for such implementation and of the privileges and immunities specified in the Protocol.

Article VIII

The first paragraph of this Article provides that the PNE Treaty shall remain in force for a period of five years and shall be automatically extended for successive five-year periods unless either Party notifies the other of its termination no later than six months prior to its expiration. This parallels the term of the TTB Treaty. Because of the close relationship of the two Treaties, identical duration periods were chosen. This paragraph also provides that neither Party may terminate the PNE Treaty while the TTB Treaty is in force.

As a counterpart to the first paragraph, the second paragraph provides that termination of the TTB Treaty shall entitle either Party to withdraw from the PNE Treaty at any time.

Paragraph 3 of this Article is the amendment provisions. Amendments to the Treaty enter into force in the same manner as the Treaty itself, i.e., upon the exchange of instruments of ratification.

Article IX

The final Article provides that the Treaty and its Protocol which forms an integral part thereof shall be subject to ratification in accordance with the constitutional procedures of each Party and shall enter into force on the day of the exchange of instruments of ratification. It further provides that such exchange of instruments of ratification shall take place simultaneously with the exchange of instruments of ratification of the TTB Treaty, thus bringing both Treaties into force at the same time. As with the TTB Treaty, the PNE Treaty is to be registered pursuant to the United Nations Charter.

Protocol to the PNE Treaty

In Article IV, paragraph 1(b), of the PNE Treaty, the Parties agree, for the purpose of assuring compliance with the provisions of the Treaty, to provide each other with information and access to the sites of underground nuclear explosions for peaceful purposes and to furnish assistance in accordance with the provisions of the

Protocol to the Treaty. The Protocol implements this Article by establishing among other things requirements concerning such information, access and assistance. It provides for the information that will be furnished before and after underground nuclear explosions, for the rights and functions of observers, who are called "designated personnel" throughout the Protocol, and for constraints that ensure the proper functioning of the verification process.

The information provisions are scaled to the planned aggregate yield of the explosion, becoming more detailed as the yield increases. For planned aggregate yields greater than 50, 75, 100 and 150 kilotons, respectively, additional categories of information must be provided to assist in verifying that the yield of each individual explosion does not exceed 150 kilotons, that group explosions do not exceed 1.5 megatons, and that the circumstances of the explosion are consistent with the stated peaceful purposes. The information must be provided not later than a specified time in advance of emplacement of the explosive. These specified times vary depending upon aggregate yield and other circumstances, but are never less than one month and, for explosions over 100 kilotons, never less than six months. After the explosion, further information on the results must be provided.

Designated personnel of the verifying Party will have an unqualified right to be present before, during and after any explosion with a planned aggregate yield greater than 150 kilotons. They will also be allowed to be present for an explosion in the planned aggregate yield range of 100 to 150 kilotons if the Parties agree that, on the basis of information provided, such presence would be appropriate for the confirmation of the yield of the explosion. Certain information, such as locations of facilities and maps of the area, are to be provided in advance to assist designated personnel in planning their activities. The numbers of observers, the geographical extent and the duration of their access, and other details are regulated by the Protocol.

The Protocol also provides privileges and immunities for designated personnel, their quarters, equipment and records. While designated personnel will not be diplomatic agents, they will be accorded rights equivalent to those accorded to diplomatic agents.

The main functions of designated personnel are as follows:

(*a*) To confirm geological and other information provided by the Party carrying out the explosion;

(*b*) To confirm that the local circumstances are consistent with the stated peaceful purposes;

(*c*) To determine that the yield of each individual explosion does not exceed 150 kilotons when the planned aggregate yield of a group explosion is greater than 150 kilotons;

(*d*) When the planned aggregate yield of a group explosion is to exceed 500 kilotons, to install a network of seismic instruments for the purpose of confirming the absence of, or detecting the presence of, a clandestine unannounced explosion under the cover of an underground nuclear explosion for peaceful purposes.

In the case of group explosions with planned aggregate yields in excess of 150 kilotons, observers will determine that the yield of each individual explosion does not exceed 150 kilotons through the use of instrumentation to measure the velocity of the hydrodynamic shock wave produced in the immediate vicinity of each individual explosion.

The Protocol provides for certain additional constraints in order to assure proper functioning of the verification procedures. For example, there are requirements for maximum and minimum distances between individual explosions constituting a group explosion, and for the maximum and minimum time for operating the local seismic network.

Finally, the Parties have agreed that the Joint Consultative Commission shall establish procedures through which they will consult for the purpose of ensuring the efficient implementation of the Protocol.

The Protocol consists of ten operative articles.

Article I

Paragraph 1 of Article I provides that no individual explosion shall taken place above a minimum depth from the ground surface. The minimum depth requirement is based on the planned yield of the explosion and is designed to limit the opportunity of gaining certain weapon-related benefits. For example, explosives buried at a depth less than that specified could provide militarily significant information on the electromagnetic pulse produced by the explosion and on the effects of the air-blast associated with such an explosion.

Paragraph 2 of Article I provides that no group explosion with a planned aggregate yield exceeding 500 kilotons shall include more than five individual explosions with a planned yield each of 50 kilotons or less. This provision was included because of the uncertainty of yield determination by existing electrical means below 50 kilotons. This limits the magnitude of this uncertainly in order to minimize the likelihood of a significant yield from any separate and unannounced explosion conducted concurrently with the group explosion.

Article II

Article II consists of ten paragraphs which set forth, in detail, the requirements for furnishing information prior and subsequent to any explosion.

Paragraph 1 contains the basic information requirement. It applies to all explosions, irrespective of yield, and requires the Party planning an explosion to furnish the following information: The purpose of the explosion; its location, expressed in geographical cordinates with a precision of four or less kilometers; its planned date and yield; the type or types of rock in which the explosion will be carried out, including the degree of liquid saturation of the rock at the point of emplacement of each explosive; and a description of the specific technological features of the project, of which the explosion is a part, that could influence the determination of its yield and confirmation of purpose.

The foregoing information must be furnished, to the extent and degree of precision available when conveyed, not later than 90 days before the beginning of emplacement of the explosives for any explosion having a planned aggregate yield not exceeding 100 kilotons, and not later than 180 days before the beginning of emplacement for any explosion having a planned aggregate yield exceeding 100 kilotons. Since the information made available as required 90 or 180 days prior to emplacement, may not be complete in all respects, paragraph 1 further provides that the Party planning the explosion furnish all required information to the full extent and with the precision specified no later than 60 days before the beginning of the emplacement of the explosives.

Paragraphs 2, 3 and 4 contain additional requirements for information to be furnished 60 days before the beginning of emplacement of explosives having a planned yield exceeding 50 kilotons, 75 kilotons and 100 kilotons, respectively

Paragraph 2 applies to explosions having a planned yield exceeding 50 kilotons and requires the Party planning the explosion to provide information on the number of explosives, the planned yield of each explosive, the location of each explosive to be used in a group explosion relative to all other explosives in the group with a precision of 100 or less meters, the depth of emplacement of each explosive with a precision of one meter, the time intervals between individual explosions in any group explosion with a precision of one-tenth second and a description of specific features of geological structure or other local conditions that could influence the determination of the yield.

Paragraph 3 applies to explosions having a planned yield exceeding 75 kilotons and requires the Party planning the explosion to provide a description of the geological and geophysical characteristics of the site of each explosion which could influence determination of the yield, which shall include: the depth of the water table; a stratigraphic column above each emplacement point, the position of each emplacement point relative to nearby geological and other features which influenced the design of the project of which the explosion is a part; and the physical features of the rock, including density seismic velocity, porosity, degree of liquid saturation, and rock strength, within the sphere centered on each emplacement point and having a radius, in meters, equal to 30 times the cube root of the planned yield in kilotons of the explosive emplaced at that point. This volume is considered adequate for an evaluation of how the energy of the explosion will be coupled into the earth. This will provide a more confident estimate of the yield of the explosion by national technical means.

Paragraph 4 applies to explosions having a planned yield exceeding 100 kilotons and requires the Party planning the explosion to provide information on locations and purposes of facilities and installations which are associated with the conduct of the explosion, information regarding the planned date of the beginning of emplacement of each explosive and a topographic plan in local coordinates of the area specified in paragraph 5 of Article IV, at a scale of 1:24,000 or 1:25,000 with a contour interval of ten meters or less.

Paragraph 5 permits the application of an explosion to alleviate the consequences of an emergency situation involving an unforeseen combination of circumstances calling for immediate action for which it would not be practicable to observe the timing requirements of paragraphs 1, 2, and 3 of this Article, provided the following conditions are met: the Party deciding to carry out an explosion for such purpose shall inform the other Party as soon as the decision has been taken and describe the circumstances; and shall provide the information specified in paragraph 1 of this Article and, if applicable, the information specified in paragraphs 2 and 3 of this Article, not later than 30 days before the beginning of emplacement of the explosives. The planned aggregate yield of an explosion for such purpose shall not exceed 100 kilotons. An example of such an application might be the use of an explosion in an effort to extinguish a gas well fire.

Paragraph 6 requires the Party planning an explosion to inform the other Party, not later than two days before the explosion, of the planned time to the nearest second of the detonation of each explosive. This information will assist designated personnel in the operation of their equipment.

Paragraph 7 requires the Party planning an explosion to provide the other Party with timely notification of any change in the information provided. This would include, for example, any change in the planned time of the explosion.

Paragraph 8 provides that an explosion shall not be carried out earlier than 90 days after notification of any change in the information provided which requires more extensive verification procedures than those required on the basis of the original information, unless the Parties agree to an earlier time for carrying out the explosion.

Paragraph 9 requires the Party that has carried out an explosion to provide the other Party within 90 days after the explosion with the following information: (a) the actual time of the explosion with a precision of one-tenth second and its aggregate yield: (b) when the planned aggregate yield of a group explosion exceeds 50 kilotons, the actual time of the first individual explosion with a precision of one-tenth second, the time interval between individual explosions with a precision of one milli-second and the yield of each individual explosion; and (c) confirmation of other information provided in accordance with paragraphs 1, 2, 3 and 4 of this Article and explanation of any changes or corrections based on the results of the explosion.

Paragraph 10 permits the Party other than the Party carrying out the explosion to request clarification, before and subsequent to an explosion, of any information furnished pursuant to this Article. Such requests may be made at any time, but not later than one year after the explosion. Clarification must be provided as soon as practicable, but not later than 30 days after the request is made.

Article III

Article III consists of five paragraphs and is the basic article setting forth the rights and functions to be exercised by designated personnel at the sites of explosions.

Paragraph 1 contains two definitions. The term "designated personnel" is defined as meaning those nationals of the other Party identified to the Party carrying out an explosion as the persons who will exercise the rights and functions provided for in the Treaty and the Protocol. The term "emplacement hole" is defined as meaning the entire interior of any drill-hole, shaft, adit or tunnel in which an explosive and associated cables and other equipment are to be installed.

Paragraph 2 provides for the exercise of rights and functions by designated personnel at the site of an explosion based upon the planned yield of the explosion. For any explosion with a planned aggregate yield exceeding 100 kilotons, but not exceeding 150 kilotons, access by designated personnel is subject to agreement between the Parties that, on the basis of information provided, such access is appropriate for the confirmation of the yield of the explosion. For any group explosion with a planned aggregate yield exceeding 150 kilotons, designated personnel have an absolute right, within the areas and at the locations described in Article V of the Protocol, to exercise specified rights and functions in accordance with detailed procedures.

As stated above, the principal rights and functions of designated personnel set forth in the Protocol fall within four general categories: (1) Confirmation that the local circumstances are consistent with the stated peaceful purposes; (2) confirmation of the validity of the geological and geophysical information provided in advance by the Party carrying out the explosion; (3) determination of the yield of each individual explosion in a group explosions having a planned aggregate yield exceeding 150 kilotons; and (4) for any group explosions having a planned aggregate yield of 500 kilotons or more, installation and operation of a local network of seismic instruments for the purpose of confirming the absence of, or the presence of, any clandestine explosions in the vicinity of the group explosion.

Paragraph 2 of this Article refers to the first two of these basic functions and in connection with the second provides that confirmation of the validity of the geological and geophysical information includes the examination of research and measurement data of the Party carrying out the explosion and of rock core or rock fragments removed from each emplacement hole, and of any logs and drill cores from existing exploratory holes, as well as the observation by designated personnel of one of four alternative procedures, to be chosen by the Party carrying out the explosion. These procedures relate to the construction of portions of the emplacement hole or of new exploratory holes and examination of rock core or rock fragments from emplacement or exploratory holes.

In addition, Paragraph 2 authorizes designated pesonnel to perform the following functions: observation of the emplacement of each explosive; confirmation of the depth of its emplacement; observation of the stemming of each emplacement hole; unobstructed visual observation of the area of the entrance to each emplacement hole at any time from the time of emplacement of each explosive until all personnel have been withdrawn from the site for the detonation of the explosives; and observation of each explosion.

Paragraph 3 provides that designated personnel shall have the right, for any explosion with a planned aggregate yield exceeding 500 kilotons, to emplace, install and operate a local seismic network, under the observation of personnel of the Party carrying out the explosion. This paragraph also authorizes the use of radio links for the transmission of data and control signals between the seismic stations and the control center, and provides that technical details, such as frequencies, and maximum power output of transmitters, be agreed upon by the Parties within the framework of the Joint Consultative Commission.

Paragraph 5 provides detailed procedures for the acquisition of documentary photographs to be taken by personnel of the Party carrying out the explosion, with the exception of those visual displays and records produced by the equipment used by designated personnel within the control center and those within the control centers taken by cameras which are component parts of such equipment.

The photographs are to be taken in the presence of and in conformity with the request of designated personnel with cameras provided by them, which shall be kept in secure storage when not in use. Such cameras shall have a built-in, rapid developing capability and a copy of each photograph shall be provided to each Party.

Requests can be made at any time for photographs of the exterior views of facilities and installations associated with the conduct of the explosion, of geological samples used for confirmation of geological and geophysical information and the equipment utilized in the acquisition of such samples, of the emplacement and installation of equipment and associated cables used for yield determination, of the emplacement and installation of the local seismic network, of the emplacement of the explosive and the stemming of the emplacement hole, and of the containers, facilities and installations for storage and operation of equipment used by designated personnel.

Article IV

Article IV describes the equipment to be used by designated personnel in the performance of their rights and functions and establishes procedures for its use.

Paragraph 1 provides that, with respect to instrumentation for yield determination, equipment for a local seismic network, geologist field tools and kits and equipment for recording of field notes, designated personnel have a choice of using their own equipment or that provided by the Party carrying out the explosion. They must notify the Party carrying out the explosion of the choice made not later than 150 days before the beginning of emplacement of the explosives.

Paragraph 2 authorizes designated personnel to use portable short-range communication equipment, field glasses, optical equipment for surveying and other items which they may specify, all of which are to be provided by the Party carrying out the explosion under procedures to be established within the Joint Consultative Commission to ensure that the equipment meets the specifications of the other Party. A description of such equipment and operating instructions must be provided to the other Party within a specified time.

Paragraphs 3 and 4 specify the components of a complete set of instruments for yield determination and of a complete set of equipment for the local seismic network, respectively.

Paragraph 5 provides that in case designated personnel choose to use the equipment of the Party carrying out the explosion for yield determination or for a local seismic network, a description of such equipment and installation and operating instructions shall be provided to the other Party within a specified time. Personnel of the Party carrying out the explosion shall emplace, install and operate such equipment in the presence of designated personnel. The emplacement must be done in accordance with the provisions of Article VI. After the explosion, designated personnel shall receive duplicate copies of the recorded data.

Paragraph 6 establishes procedures for the more likely case that designated personnel will choose to use their own equipment for yield determination and for a local seismic network. The purpose of these procedures is to give assurance to the host Party that the equipment does not have the capability to acquire information not needed for verification and to give assurance that the equipment has not been surreptiously modified by either Party. These procedures are as follows:

(a) One complete set of equipment for yield determination and one complete set of equipment for the local seismic network including one seismic station, electrical and mechanical design information, specifications and installation and operating instructions, shall be provided for familiarization to the Party carrying out the explosion not later than 150 days before beginning of emplacement of the explosives. The equipment shall be returned to the other Party not later than 90 days before the beginning of emplacement of the explosives.

(b) Two complete sets of equipment for yield determination and two complete sets of equipment for the local seismic network essentially identical to that provided for familiarization shall be delivered in sealed containers, to the port of entry specified by the host not later than 35 days prior to the beginning of emplacement of the explosives in connection with which the equipment is to be used.

(c) The Party carrying out the explosion shall choose one of each of the two sets described in subparagraph (b), which shall be used by designated personnel in connection with the explosion.

(d) The set or sets of equipment not chosen shall be at the disposal of the Party carrying out the explosion until 30 days after the explosion when it shall be returned to the other Party.

(e) The chosen set or sets of equipment shall be transported by the Party carrying out the explosion in containers of the verifying Party to the site of the explosion, so as to arrive not later than 20 days before the beginning of emplacement of the explosives. These containers will have been sealed in a manner which will reveal intrusion. This equipment shall remain in the custody of designated personnel or in agreed secure storage. Personnel of the Party carrying out the explosion shall have the right to observe the use of this equipment by designated personnel during the time the equipment is at the site of the explosion. Before the beginning of emplacement of the explosives, designated personnel shall demonstrate to personnel of the Party carrying out the explosion that this equipment is in good working order.

(f) Each set of equipment shall include two sets of components for recording data and certain associated calibration equipment. Both of these sets of components in the equipment chosen for use shall simultaneously record data. After the explosion, and after duplicate copies of all data have been obtained by designated person-

nel and the Party carrying out the explosion, one of each of the two sets of components for recording data and associated calibration equipment shall be selected, by an agreed process of chance, to be retained by designated personnel. Designated personnel shall pack and seal such components for recording data and associated calibration equipment which shall accompany them from the site of the explosion to the port of exit; and

(g) All remaining equipment may be retained by the Party carrying out the explosion for a period that may be as long as 30 days, after which time this equipment shall be returned to the other Party.

Paragraph 7 provides for the emplacement, installation and operation of a local seismic network at agreed sites, within a specified area, for any explosion with a planned aggregate yield exceeding 500 kilotons. The number of stations shall not exceed the number of explosives in the group plus five and may be located as far away as 15 kilometers from any explosive point. This network may be installed and operated during the period beginning not later than 20 days before the beginning of emplacement of the explosives and ending not later than three days after the explosion, unless otherwise agreed by the Parties. This period of post explosion operation would enable the network to record signals caused by cavity collapse and may assist in confirming the collapse of a cavity caused by an unannounced explosion in a group.

Paragraph 8 provides for the examination by the Party carrying out the explosion of the geologist field tools of designated personnel, as well as of their equipment for recording of field observations. Such examination must be carried out in the presence of designated personnel.

Paragraph 9 provides for the consideration by the Joint Consultative Commission of proposals made by either Party for the joint development of standardized equipment for verification purposes.

Article V

Article V contains the provisions for access of designated personnel to the sites of explosions and related provisions. This right to access is absolute for explosions having a planned aggregate yield exceeding 150 kilotons, but requires agreement between the Parties for explosions having a planned aggregate yield exceeding 100 kilotons but not exceeding 150 kilotons. Subject to such agreement, paragraph 1(a) permits access, in the case of an explosion with a planned aggregate yield exceeding 100 kilotons, to the locations of facilities and installations associated with the conduct of the explosion and to the location of the activities described in paragraph 2 of Article III, which relate to the confirmation of the validity of geological and geophysical information provided by the Party carrying out the explosion.

Additional access rights are provided for explosions having a planned aggregate yield exceeding 150 kilotons. For such explosions, designated personnel, in addition to the rights granted by paragraph 1(a), have the right of access (a) to other locations within an area circumscribed by circles of 10 kilometers with radii centered on points on the surface of the earth directly above the points of emplacement in order to confirm that the local circumstances are consistent with the stated peaceful purposes and (b) to locations of components of the instrumentation for yield determination, if located outside the above described area; and to the sites of emplacement of the components of the local seismic network.

Paragraph 2 requires the Party carrying out the explosion to notify the other Party as to which of the four alternative procedures for confirmation of geological data, specified in sub-paragraph 2(b)(3) of Article III, it has chosen. Such notification must be given not later than 30 days before the implementation of the procedure chosen. Designated personnel have the right to be present at the site of the explosion for a period of time beginning two days before the start of the implementation of the procedure and continuing for a period of three days after its completion.

Paragraph 3 provides that, except during the time when all personnel have been evacuated from the site of the explosion, designated personnel shall have the right if agreed between the Parties, to be present for an explosion with a planned aggregate yield exceeding 100 kilotons, but not exceeding 150 kilotons, at any time beginning five days before the beginning of emplacement of the explosives and continuing for a period of two days after safe access has been established to evacuated areas following the explosion. For aggregate yields above 150 kilotons, but not exceeding 500 kilotons, designated personnel shall have the right to be present 20 days before emplacement of the explosive and to remain until 5 days after the explosion. For aggregate yields above 500 kilotons, designated personnel shall have the right to be present 20 days before emplacement of the explosive and to remain until 8 days after the explosion. The availabile time in the latter case is increased because the seismic system permitted to be installed for aggregate yields above 500 kilotons may continue to operate until 3 days after the explosion.

Paragraph 4 provides that designated personnel shall not have the right to be present in areas from which all personnel have been evacuated for the purpose of executing the explosion, but shall have the right to reenter at the same time as personnel of the Party carrying out the explosion.

Paragraph 5 prohibits designate personnel from having or seeking access to the interior of the canister containing the explosive, to documentary or other information descriptive of the design of an explosive or to equipment for control and firing of explosives. To preclude the possibility that the foregoing provision might be construed to hinder verification activities, this paragraph further provides that the Party carrying out the explosion shall not cause documentary or other information descriptive of an explosive to be located in such a way as to impede designated personnel in the exercise of their rights and functions.

Paragraph 6 establishes the procedure for determining the number of designated personnel permitted to be present at the site of an explosion. The number is determined as follows:

(*a*) For confirming geological and geophysical information—the number of emplacement holes plus three;

(*b*) For confirming that the local circumstances are consistent with the stated peaceful purposes, for observing the emplacement of the explosive confirming the depth of its emplacement and observing the stemming of each emplacement hole; for observing the area of entrance to each emplacement hole from time of emplacement until all personnel have been withdrawn from the site for the detonation; and for observing each explosion—the number of explosive plus two:

(*c*) For the activities listed in (a) and (b) above and for the use of instrumentation for yield determination—the number of explosives plus seven;

(*d*) For the activities listed in (b) and (c) above and for the use of the local seismic network—the number of explosives plus 10.

Paragraph 7 permits personnel of the Party carrying out the explosion to accompany designated personnel while the latter exercise their rights and functions.

Paragraph 8 requires the Party carrying out an explosion to ensure that designated personnel are provided with telecommunication links with their authorities, transportation and other services appropriate to their presence, and the unimpeded exercise of their rights and functions at the site of the explosion.

Paragraph 9 provides that the verifying Party shall bear the expenses incurred for the transportation of designated personnel and their equipment to and from the site of the explosion, their telecommunications activities, their living and working quarters, their subsistence and other personal expenses. Other expenses incurred at the site of an explosion not explicitly covered by paragraph 9 would be paid by the Party carrying out the explosion.

Paragraph 10 provides for consultation between designated personnel and the Party carrying out the explosion for the purpose of coordinating their respective activities. Procedures for such consultation are to be established in the Joint Consultative Commission.

Article VI

Article VI contains additional requirements for group explosions with a yield exceeding 150 kilotons. These relate to the use of instrumentation to determine the yield of each individual explosion in the group.

Paragraph 1 permits the yield determination to be made by measuring the velocity of the explosively-generated shock wave in the hydrodynamic region.

Such measurements are made by placing a co-axial cable close to the explosive. The lower end of the cable is purposely short-circuited electrically. When the explosive is detonated the cable is crushed as the shock wave expands outwardly, and the location of the electrical short-circuit moves up the cable at a speed related to the yield of the explosive. The data are recorded on equipment located at a considerable distance from the explosion and are later analyzed to determine the yield.

Paragraph 2 requires the Party carrying out the explosion to inform the other Party, not later than 60 days before the beginning of emplacement of the explosives, of the length of each canister containing an explosive, the dimensions of the tube or other device used to emplace the canister, the cross-sectional dimensions of the emplacement hole to a distance, in meters, from the emplacement point of 10 times the cube root of its yield in kilotons, and a description of materials, including their densities, to be used to stem each emplacement hole.

Paragraph 2 further requires the Party carrying out the explosion to furnish the other Party, not later than 30 days before the beginning of emplacement of the explosives, for each emplacement hole, with (a) the local coordinates of the point of emplacement of the explosive, (b) the entrance of the emplacement hole, (c) the point of the emplacement hole most distant from the entrance, (d) the location of the emplacement hole at each 200 meters from the entrance, and (e) the configuration of any known voids larger than one cubic meter located within a distance, in meters, of 10 times the cube root of the planned yield in kilotons, measured from the bottom of the canister containing the explosive. The factor of error in these coordinates shall not exceed one percent of the distance between the emplacement hole and the nearest other emplacement hole, or one percent of the distance between the point of measurement and the entrance of the emplacement hole, whichever is smaller, but in no case shall the factor of error be required to be less than one meter.

Paragraph 3 provides for the emplacement of yield measuring instrumentation in the same emplacement hole as the explosive, in accordance with installation instructions previously supplied. This emplacement is to be done by the Party carrying out the explosion, under the observation of designated personnel. Other equipment, which is not located in the emplacement hole, consisting of the control center, electrical power supplies, and cables for transmisison of electrical power, control signals, and data, is to be emplaced and installed by designated personnel under the observation and with the asistance of personnel of the Party carrying out the explosion, if desginated personnel request such assistance.

Paragraph 4 places a restriction on the minimum spacing between yield-measuring instrumentation and the explosive. During the negotiations, the U.S.S.R. side was concerned that if the spacing were too close, unwarranted data might be collected. At the same time it was recognized by both sides that such instrumentation must be located within the hydrodynamic region to obtain meaningful data. The spacing criteria agreed to specifies the minimum distance between the end of the cable and the bottom of the explosive canister; for yields below 20 kilotons it is at a distance in meters of 3.5 times the cube root of the planned yield in kilotons; for yields above 20 kilotons it is 3 times the cube root of the yield.

Paragraph 4 also specifies that canisters having a length greater than 10 meters shall only be used if there is prior agreement between the Parties. It further provides that the Party carrying out the explosion furnish the other Party with data on the distribution of density inside any other canister in the emplacement hole with a transverse cross-sectional area exceeding 10 square centimeters located with a distance, in meters, of 10 times the cube root of the planned yield in kilotons of the explosion from the bottom of the canister containing the explosive. In addition, the Party carrying out the explosion is to provide the other Party with access to confirm the data on density distribution with any such canister.

Paragraph 5 sets forth specific requirements for the stemming or filling of each emplacement hole. The Party carrying out an explosion shall fill each emplacement hole, including all pipes and tubes contained therein, which have at any transverse section an aggregate cross-sectional area exceeding 10 square centimeters in the region containing the electrical equipment for yield determinaton, and to a distance in meters of six times the cube root of the planned yield of the explosive in kilotons from the explosive emplacement point, with material having a density not less than seven-tenths of the average density of the surrounding rock, and from that point to a distance of not less than 60 meters from the explosive emplacement point with material having a density greater than one gram per cubic centimeter.

Paragraph 6 authorizes designated personnel to confirm the information provided pursuant to paragraph 2 of this Article.

Paragraph 7 contains specific separation requirements for the emplacement of explosives in separate emplacement holes and timing requirements between individual explosions within a group.

Paragraph 8 contains specific separation requirements for the emplacement of explosives in a common emplacement hole and timing requirements for the detonation of the explosives.

Article VII

Article VII provides for the privileges and immunities of designated personnel.

Paragraph 1 provides that designated personnel with their baggage and equipment shall be permitted to enter the territory of the Party carrying out the explosion at an entry port to be agreed upon by the parties, to remain in such territory for the purpose of fulfilling their rights and functions and to depart from an exit port to be agreed upon by the Parties.

Paragraph 2 provides that designated personnel, their property, personal baggage, archives and documents, as well as their temporary official and living quarters, shall be accorded the same privileges and immunities as those provided to the persons, property, personal baggage, archives and documents of diplomatic agents, as well as to the premises of diplomatic missions and private residences of diplomatic agents, pursuant to Articles 22, 23, 24, 29, 30, 31, 34, and 36 of the Vienna Convention on Diplomatic Relations. The Articles named are those portions of the Vienna Convention which are relevant and applicable to the temporary character of the presence of designated personnel under this Treaty. In general these provisions will render the persons, property, documents, offices and living quarters of designated personnel immune from search, seizure, arrest, suit, legal process, and taxation.

Paragraph 3 imposes a duty on designated personnel, without prejudice to their privileges and immunities, to respect the laws and regulations of the state in whose territory the explosion is to be carried out, provided these laws and regulations do not impede the proper exercise of their rights and functions. This proviso is to ensure that domestic laws and regulations will not be used for the purpose of hampering legitimate verification activities.

Article VIII

Article VIII provides that the Party carrying out an explosion shall have sole and exclusive control over, and full responsibility for, the conduct of the explosion. Therefore, the Party carrying out an explosion would have sole responsibility for any damage or injuries to third parties resulting from the explosion.

Article IX

Paragraph 1 provides that nothing in the Treaty or the Protocol shall affect proprietary rights in information made available under the Treaty and the Protocol or in information which may be disclosed in preparation for and carrying out of explosions; however, no claims to such proprietary rights may impede the implementation of the provisions of the Treaty and the Protocol.

Paragraph 2 provides that the public release of information furnished under Article II of the Protocol, the publication of material using such information, and the public release of the results of observation and measurements obtained by designated personnel may take place only by agreement between the Parties, but that the other Party has the right to issue statements after the explosion which do not divulge information in which the Party carrying out the explosion has any proprietary rights.

Article X

The final Article requires the Joint Consultative Commission to establish procedures through which the Parties will, as appropriate, consult for the purposes of ensuring the efficient implementation of the Protocol.

VI. LETTERS FROM PRESIDENTS FORD AND REAGAN

LETTER OF TRANSMITTAL FROM PRESIDENT FORD

LETTER OF TRANSMITTAL

THE WHITE HOUSE, *July 29, 1976.*

To the Senate of the United States:

With a view to receiving the advice and consent of the Senate to ratification, I transmit herewith the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests, and the Protocol thereto, referred to as the Threshold Test Ban Treaty (TTB Treaty), and the Treaty between the United States of America and the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto (PNE Treaty). The TTBT was signed in Moscow on July 3, 1974 and the PNE Treaty was signed in Washington and Moscow on May 28, 1976. For the information of the Senate, I transmit also the detailed report of the Department of State on these Treaties.

These Treaties together establish procedures for the conduct of all underground nuclear explosions by the United States and the Soviet Union. All nuclear explosions other than underground nuclear explosions are prohibited by the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under

Water (the Limited Test Ban Treaty) of 1963. The TTB Treaty and PNE Treaty are the first agreements since the Limited Test Ban Treaty to impose direct restraints on nuclear explosions by the Parties and, as such, contribute to limiting nuclear arms competition.

These two Treaties represent approximately two years of intensive effort. Negotiation of the TTB Treaty began in the Spring of 1974 and was completed in July of that year. However, the question of the relationship of underground nuclear explosions for peaceful purposes to limitations on nuclear weapon testing was not then resolved. As a result, Article III of the TTB Treaty provided that the Parties would negotiate and conclude an agreement governing underground nuclear explosions for peaceful purposes. Work on the PNE Treaty began in the Fall of 1974 and after six lengthy negotiating sessions was completed in April of 1976.

The TTB Treaty and the PNE Treaty are closely interrelated and complement one another. The TTB Treaty places a limitation of 150 kilotons on all underground nuclear weapon tests carried out by the Parties. The PNE Treaty similarly provides for a limitation of 150 kilotons on all individual underground nuclear explosions for peaceful purposes.

During the negotiation of the PNE Treaty, the Parties investigated whether individual explosions with yields above 150 kilotons could be accommodated consistent with the agreed aim of not providing weapon-related benefits otherwise precluded by the TTB Treaty. The Parties did not develop a basis for such an accommodation, largely because it has not been possible to distinguish between nuclear explosive device technology as applied for weapon-related purposes and as applied for peaceful purposes. The Parties therefore agreed that the yield limitations on individual explosions in the two Treaties would be the same.

The TTB Treaty and the PNE Treaty contain numerous provisions to ensure adequate verification, including some concepts, more far-reaching than those found in previous arms control agreements, which are not only important in themselves but which will have significant precedential value as well. For example, the Limited Test Ban Treaty is verified only by national technical means. The TTB and PNE Treaties add requirements for exchange of specific information in advance to assist verification by national technical means, and the PNE Treaty establishes procedures for on-site observation under certain conditions on the territory of the Party conducting the explosion.

The TTB Treaty provides for an exchange of data on the geography and geology of nuclear weapon test sites as well as the yields of some actual weapons tests conducted at each site. The PNE Treaty requires that the Party conducting any underground nuclear explosion for peaceful purposes provide the other Party in advance with data on the geography and geology of the place where the explosion is to be carried out, its purpose, and specific information on each explosion itself. These requirements are related to the yield of the explosion and become more detailed as the magnitude of the explosions increase.

In addition to the limitation on individual nuclear explosions of 150 kilotons, the PNE Treaty provides for an aggregate yield limitation of 1.5 megatons on group underground nuclear explosions for peaceful purposes. A group explosion consists of substantially simultaneous individual explosions located within a specific geometrical relationship to one another. The Treaty provides for mandatory on-site observer rights for group explosions with an aggregate yield in excess of 150 kilotons in order to determine that the yield of each individual explosion in the group does not exceed 150 kilotons and that the explosions serve the stated peaceful purposes. The Treaty also provides for on-site observers for explosions with an aggregate yield between 100 and 150 kilotons if both Parties agree, on the basis of information provided, that such observers would be appropriate for the confirmation of the yield of the explosion.

The TTB Treaty and the PNE Treaty, taken together as integrated and complementary components of this important limitation on nuclear explosions, provide that very large yield nuclear explosions will no longer be carried out by the Parties. This is one more useful step in our continuing efforts to develop comprehensive and balanced limitations on nuclear weapons. We will continue our efforts to reach an adequately verifiable agreement banning all nuclear weapon testing, but in so doing we must ensure that controls on peaceful nuclear explosions are consistent with such a ban. These Treaties are in the national interest, and I respectfully recommend that the Senate give its advice and consent to ratification.

GERALD R. FORD.

LETTER REQUESTING SENATE ACTION FROM PRESIDENT REAGAN

To the Senate of the United States:

Two treaties between the United States of America and the Union of Soviet Socialist Republics on (1) the Limitation of Underground Nuclear Weapon Tests, and the Protocol thereto, known as the Threshold Test Ban Treaty (TTBT) signed in Moscow on July 3, 1974, and (2) Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto, known as the Peaceful Nuclear Explosions Treaty (PNET) signed in Washington and Moscow on May 28, 1976, were transmitted to the Senate by President Ford on July 29, 1976 with a view to receiving advice and consent to ratification. (Senate Executive N, 94th Cong., 2d Sess.) Although hearings were held a year later, the Senate itself has not acted on the treaties. I ask the Senate to consider there important treaties anew in light of developments that have taken place over the last decade.

On August 14, 1986, I transmitted to the Congress a comprehensive study which stated U.S. national security concerns as well as our views on necessary verification improvements to the TTBT and the PNET, in response to the requirements of Section 1003 of the FY 1986 Department of Defense Authorization Act (P.L. 99-145). I am enclosing a copy of this study and commend it to your attention.

The security of the United States and the entire free world, today and for the foreseeable future, depends on the maintenance of an effective and credible nuclear deterrent by the U.S. This is a considerable challenge, in light of continuing efforts by the Soviet Union to undercut the effectiveness of our deterrent. With the support of Congress we have succeeded in meeting this challenge, and together we must continue to do so in the future.

Today I am requesting per my October 10, 1986 letter that the Senate give advice and consent, subject to the condition set out below, to two pending treaties that have significant implications for Western security: The TTBT and PNET. These treaties have the common purpose of limiting individual nuclear explosions to no more than 150 kilotons. The TTBT, which prohibits nuclear weapons tests above 150 kilotons, places significant constraints on the efforts we may undertake in the U.S. nuclear test program to respond to Soviet nuclear and non-nuclear activities aimed at undercutting our deterrent. Hence, it is imperative that we have the necessary provisions that will make the TTBT effectively verifiable and thus assure ourselves that the Soviet Union is fulfilling its obligations and is thereby equally constrained.

Unfortunately, as I have frequently stated and the enclosed study makes clear, the TTBT and PNET are not effectively verifiable in their present form. Large uncertainties are present in the current method employed by the United States to estimate Soviet test yields. I have on several occasions reported to the Congress on the problems with Soviet compliance with the TTBT. Therefore, achieving Soviet agreement to improved verification measures that would provide for effective verification of these treaties has been my highest priority in the area of nuclear testing limitations.

As I stated in my March 14, 1986 letter to General Secretary Gorbachev, effective verification of the TTBT and PNET requires that we reduce the current unacceptable level of uncertainty in our estimates of the yields of nuclear tests. Indeed, leaders in previous Congresses have shared my view that the present large degree of uncertainty in such estimates is unacceptable, as well as my desire for sharp improvements. In this regard, we require—and have conveyed to the Soviets that we require—effective verification through direct, on-site hydrodynamic yield (CORRTEX) measurement of all appropriate high-yield nuclear detonations. Further, I informed General Secretary Gorbachev that, if the Soviet Union would agree to essential verification procedures for the TTBT and the PNET, I would then be prepared to request the advice and consent of the Senate to ratification of the treaties. Ratification of the treaties without such provisions would be contrary to the national security interests of the United States.

As written, the TTBT relies solely on teleseismic detection and yield measurement systems and on inadequate, and unverifiable data exchange. The Soviet Union has apparently had problems in correctly assessing the yields of U.S. nuclear tests. Despite our best efforts, the Soviet Union has so far not accepted our practical proposal for achieving the necessary verification improvement of the TTBT and the PNET. We have not yet found any alternative approach which equals the effectiveness of CORRTEX—we are striving to achieve a yield-estimation accuracy of about 30 percent by this method. We have, nonetheless, advise the Soviets, at three Geneva nuclear testing experts meetings in 1986, that the U.S. is willing to consider any other direct yield measurement method the

Soviets might propose, provided it is at least as capable (in terms of accuracy and non-intrusiveness) as CORRTEX. To date, they have not been forthcoming in proposing or explaining alternative verification techniques that would meet our requirements.

Recognizing the role of the Senate in the ratification process, I am therefore requesting that the Senate give its advice and consent to ratification of the TTBT and the PNET, subject to a condition in the following form:

> The Senate's Resolution of advice and consent to ratification is subject to the condition that the President shall not proceed with ratification of the Treaty on Limitation of Underground Weapon Tests and the Treaty on Underground Nuclear Explosions for Peaceful Purposes until the President has certified to the Senate that the Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty on Limitation of Underground Weapon Tests and including provisons for direct, accurate yield measurement taken at the site of all appropriate nuclear detonations so that the limitations and obligations of these treaties, inter alia the 150 kiloton limit, are effectively verifiable, and until such agreements have been submitted to the Senate, and the Senate has advised and consented to their ratification.

I am hopeful we can reach an agreement with the Soviet Union which will allow me to certify that the treaties are effectively verifiable. I will be prepared to ratify the TTBT and the PNET at such time as the condition cited above has been fulfilled.

Further, I informed the General Secretary in Reykjavik that, once our verification concerns have been satisifed and the treaties have been ratified, and in association with a program to reduce and ultimately eliminate all nuclear weapons, I would propose that the United States and the Soviet Union immediately engage in negotiations on ways to implement a step-by-step parallel program of limiting and ultimately ending nuclear testing.

The steps in this program would take into account our longstanding position that a comprehensive test ban is a long-term objective which must be viewed in the context of a time when we do not need to depend on nuclear deterrence to ensure international security and stability, and when we have achieved broad, deep, and verifiable arms reductions, substantially improved verification capabilities, expanded confidence-building measures, and greater balance in conventional forces.

RONALD REAGAN.

THE WHITE HOUSE, *January 13, 1987.*

SPECIAL REPORT NO. 152: VERIFYING NUCLEAR TESTING LIMITATIONS: POSSIBLE U.S.-SOVIET COOPERATION

(U.S. Department of State, *Bureau of Public Affairs*, Washington, DC, August 14, 1986)

Following is the President's letter to Congress of August 14, 1986, transmitting an interagency study prepared by the U.S. Arms Control and Disarmament Agency.

TRANSMITTAL LETTER

To the Congress of the United States:

In response to the requirements of Section 1003 of the FY 1986 Department of Defense Authorization Act (P.L. 99-145), I am pleased to transmit this unclassified interagency study of possible avenues of cooperation between the United States and the Soviet Union in the development of verification capabilities consistent with national security restrictions.

The requirements under Section 1003 involves: "limited exchanges of data and scientific personnel," in general, and "joint technological effort in the area of seismic monitoring," in particular. Upon review of a number of possible scientific disciplines, it was concluded that in terms of this study, nuclear testing issues appear to offer the most promising avenues for such "scientific" cooperation and data exchange. Therefore, the attached study focuses its examination on matters relating to the verification of limitations in nuclear testing.

While the attached study focuses on nuclear testing limitations, it should be noted that in other arms control areas as well, the Administration believes that exchanges of information would, in addition to various monitoring provisions including types of on-site inspections, play an important role in establishing a verification framework.

In START [strategic arms limitation talks] and INF [intermediate-range nuclear forces], for example, areas of possible exchange of information might include the declaration of missile and launcher facilities, the numbers of missiles and launchers at such facilities, and information on the destruction of missiles and launchers that are in excess of agreed treaty limits. In the negotiations on Mutual and Balanced Force Reductions (MBFR), we have asked for an exchange of information, to be updated annually, on the structure of forces subject to MBFR limitations. At the Stockholm Conference on Confidence- and Security-Building Measures in Europe (CDE), we believe it important to have an exchange of information both on overall force structures and on specific forces participating in military activities. In chemical weapons arms control, we believe it important, among other things, to have a preliminary bilateral exchange of data on chemical weapons stockpiles and on production facilities as a confidence-building measure prior to the entry into force of a convention banning such weapons.

The prospects for progress in arms control may be significantly enhanced if a regime of cooperation between the United States and the Soviet Union in the development of verification capabilities consistent with national security restrictions can be established.

The attached interagency study describes some possible avenues of cooperation that could produce benefits in the near term in the nuclear testing limitations area.

As indicated in the attached study, the United States has long sought a meeting with the Soviets to present our concerns about the verification provisions of the Threshold Test Ban Treaty (TTBT) and the Peaceful Nuclear Explosions Teaty (PNET). The United States and the Soviet Union recently agreed to have experts meet to discuss issues related to nuclear testing.

This meeting of experts, which took place in Geneva July 25–August 1, allowed the United States to present its ideas and concerns to the Soviet Union and to hear Soviet views. At the meeting, the United States presented its views of verification improvements in existing agreements, which we believe are needed and achievable at this time. A follow-on meeting of U.S. and Soviet experts is scheduled for September. We hope the Soviet Union will join in a constructive dialogue.

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INTERAGENCY STUDY

Possible avenues for cooperation with the Soviet Union in the development of capabilities for verifying compliance with nuclear testing limitations

I. Introduction

Section 1003 of the FY 1986 Department of Defense Authorization Act (S. 1160) calls for an interagency study of "limited exchanges of data and scientific personnel" in general and "joint technological effort in the area of seismic monitoring" in particular. After reviewing an number of possible scientific disciplines, it was concluded that nuclear testing issues appear to offer the most promising avenues for scientific cooperation and data exchange. This study, therefore, focuses on matters relating to the verification of limitations in the area of nuclear testing.

II. Background

Effective means of verification are of critical importance to arms control. Our national security requires that we be able to assess with confidence compliance with any negotiated arms control agreements. Today, most of our major arms control agreements are monitored through what is known as national technical means of verification (NTM). While NTM has the primary benefit of being under the control of the verifying party, there are some particular applications—such as for strategic and intermediate-range nuclear forces, conventional and chemical forces, and nuclear testing--in which cooperative means of verification may be beneficial or even necessary.

Cooperative means can include various onsite inspection and data exchange measures for direct measurement schemes such as would apply to determining the yields of underground nuclear tests. Onsite inspection by observers and instruments may be able to play a role in deterring violations at agreed locations or "declared sites." The utility of onsite inspection is largly a function of its frequency and duration and whether, and at what costs, the activities monitored can be conducted at other times and places. Other considerations with regard to onsite inspection include the question of how the party being monitored calculates the risk of violations being uncovered and whether they could avoid *any* single inspection that would detect a violation. Thus, the past record of the inspected party is a vital consideration.

Data exchanges may be beneficial to provide a benchmark for assessing compliance. If, however, the verifying party does not possess a means of independently validating the data it receives, large uncertainties could still prevail, diminishing the utility of the exchange. Nevertheless, as the amount of data exchanged is increased, the uncertainty should decrease while the difficulty of concealing illegal activities increases.

Direct measurements have the benefit of allowing the verifying party to control the means of monitoring. Direct measurement is not perfect because it is limited by the accuracy of the instruments used and, as is the case for all monitoring methods, the ability of the inspected party to manipulate the evidence. Furthermore, direct measurement will not detect violations conducted at times and places when direct measurement equipment is not engaged and normally will not detect violations when special efforts are undertaken to conceal prohibited activities. However, even considering these limitations, direct measurement is much more definitive than any remote sensing method for determining the yields of Soviet nuclear tests.

The Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests (Threshold Test Ban Treaty—TTBT) prohibits U.S. and Soviet underground nuclear weapon tests with yields greater than 150 kilotons (kt). The TTBT is a treaty signed by both parties but ratified by neither. Both the U.S. and the U.S.S.R. have separately stated that they would abide by the yield limitation. Furthermore, since neither party has made its intentions clear not to become a party, both signatories are obligated by international law to refrain from acts that would defeat the object and purpose of the treaty. At present, however, the United States cannot effectively verify Soviet compliance with the treaty. Moreover, the implementation of the verification measures set forth in the Protocol to the treaty (exchange of yield, date, time, depth, and coordinates for two nuclear weapon tests for calibration purposes from each geophysically distinct testing area and information on the geology of the testing areas), which would become effective upon ratification, will not provide this capability, since there is no way for the United States to independently verify the data exchanged, nor would the data, if validated, be sufficient to ensure effective verification.

Today, we monitor Soviet tests with seismic equipment located outside the U.S.S.R. In three presidential reports to Congress on Soviet noncompliance, the uncertainty in yield derived from seismic measurements, when taken into account, resulted in findings of only "likely violation," even though the seismic evidence indicates that a number of Soviet tests have central yield values above the 150 kt threshold. "Central yield" is defined as the yield corresponding to mean value of seismic body wave magnitudes for a particular nuclear test. While we judge that, at present, there is approximately a factor of two uncertainty in the yield estimates derived by seismic methods, there are reasons to suggest the uncertainty could be actually smaller (or conceivably larger). A factor of two uncertainty means, for example, that a Soviet test for which we derive a "central yield" value of 150 kt may have, with a 95% probability, a yield as high as 300 kt or as low as 75 kt.

As already mentioned, the verification provisions contained in the Protocol of the unratified TTBT would not reduce this level of uncertainty to an acceptable level. The U.S. Government has, therefore, continued its longstanding effort to obtain a means of monitoring that would substantially reduce our verification uncertainty. The history of the search for verifiable nuclear testing limitations will provide a backdrop for an understanding of the complicated and sometimes frustrating search for possible avenues of cooperation with the Soviet Union in the development of verification capabilities.

III. Historic perspective on nuclear testing limitations

One of the earliest proposals for nuclear testing limitations was presented in terms of a comprehensive test ban as part of a broader disarmament proposal made by the Soviets in the UN Disarmament Commission in May 1955. However, there was no movement in this area for the next 3 years. Early in the spring of 1958, President Eisenhower suggested to Soviet Premier Khrushchev that a group of technical experts meet to determine what specific control measures would be required to ensure compliance with a nuclear test ban. After several exchanges, Khrushchev agreed, and the Geneva Conference of Experts To Study the Possibility of Detecting Violations of a Possible Agreement on the Suspension of Nuclear Tests was formed. Technical discussions between experts from the U.S.S.R., Poland, Czechoslovakia, Romania, the United Kingdom, France, Canada, and the United States began in July 1958.

On August 21, 1958, the Conference of Experts adopted a final report for consideration by governments. The report recommended a worldwide system of land control posts, shipborne posts, and regular and special air-sampling flights to monitor an agreement banning nuclear weapon tests in the atmosphere, underwater, and underground. Their report was accepted as the technical basis for political negotiations by the United States, the United Kingdom, and the U.S.S.R., and the Geneva Conference on the Discontinuance of Nuclear Weapon Tests began on October 31, 1958. The technical basis of the international control system was provided mainly by the reports of the 1958 Conference of Experts and a 1959 technical working group of the Geneva conference on the detection of high-altitude tests. These reports recommended a worldwide network of 160–170 land control posts, 10 shipborne posts, regular and special aircraft flights, and space satellites. The United States believed, however, that there was a serious risk that small underground explosions might remain undetected or be incorrectly identified as earthquakes.

The experts' report was technically limited in two respects: (1) it did not cover tests at more than 30-50 kilometers above the earths surface, and (2) it did not have the benefit of the new seismic data obtained from the Hardtack underground test series carried out by the United States after the report was submitted. The new seismic data submitted by the American delegation in Geneva in June 1959, showed that the proposed control system would have been less effective for detecting and identifying underground tests than the experts had believed.

At the request of the State Department, the President's Special Assistant for Science and Technology appointed a Panel on Seismic Improvement, headed by Dr. Lloyd Berkner, to study the new seismic data. The Berkner panel's report recommended a number of new techniques and proposed a research program to improve the capability of the verification system, described in the Geneva Conference of Experts' report, to detect and identify underground tests. The panel recommendations were the basis for much of the succeeding research in seismology and resulted in the development of new concepts in seismic stations, instrument arrays, computational techniques, and research into the phenomenology associated with seismic waves from explosions and earthquakes.

In the political negotiations, the United States tried unsuccessfully to persuade the Soviet Union to enter new technical discussion on the detection of high-altitude tests and the new seismic data. The Soviets took the position that technical questions had been settled at the 1958 Conference of Experts and any needed improvements in the control system could be made by the Control Commission after the treaty came into operation.

The participants at the Geneva Conference on the Discontinuance of Nuclear Weapon Tests agreed with the principle that onsite inspection would be necessary to clarify the source of unidentified seismic events. The United States believed that there could be up to 100 unidentified events per year of which approximately 20 would require inspection of the site. There was disagreement between the United States and the Soviets on the number of onsite inspections that would be permitted. The Soviets wanted to limit each party to two or three onsite inspections per year when it was considered necessary. (Note: the Soviets, in effect, reserved for themselves a veto over onsite inspection requests.) Although the issues of numbers and mandatory versus voluntary onsite inspection were never resolved, the fact that the Soviets agreed in principle to the need for onsite inspection was widely hailed and was seen as setting a precedent for future arms control agreements. It was hoped that interim measures could be achieved that, with time, could lead to a more comprehensive agreement between the sides. The Soviets took the position that verification was less essential than reaching an agreement. The United States and the United Kingdom held that strict means of verification were required, that further study should be undertaken to assure that any agreement could be verified, and that this should be done before an agreement was signed.

On April 18, 1961, the United States and the United Kingdom submitted a complete draft treaty to the Geneva conference.[1] This proposal was based on one made by President Eisenhower in February 1960. The Anglo-American draft treaty included a commitment to cease tests in the atmosphere, underwater, at high altitudes, and underground (above seismic magnitude 4.75), and a control regime for detection and identification. Although the general characteristics of the international control system proposed in the Anglo-American draft treaty had long been accepted by both sides, the Soviet Union shifted its position on several vital verification features. For example, although the Soviets had agreed to 15 seismic stations within the U.S.S.R., they insisted that they would operate these sites. Again, even though the need for onsite inspection was recognized by the Soviets, the number of inspections proposed by the Soviets and the conditions under which they could be conducted were not satisfactory to the United States and the United Kingdom.

Throughout the test ban negotiations at Geneva from October 1958 to August 30, 1961, the United States and the United Kingdom faithfully observed a voluntary suspension of nuclear weapons tests, even though there existed no means of knowing with certainty, in the absence of an effective and workable international control system, that the Soviet Union was not increasing its nuclear capability by clandestine tests. In August 1961, the Soviet Union announced that it was resuming nuclear weapons tests and did so on September 1, 1961. The United States immediately condemned the Soviet action and reaffirmed its support for an agreement to end nuclear weapons tests under effective safeguards. On September 3, President Kennedy and Prime Minister Macmillan proposed that the Soviets agree "not to conduct nuclear tests which take place in the atmosphere and produce radioactive fallout." They stated that they were willing to rely upon existing means of detection, "which they believe to be adequate," and they did not suggest any additional controls. The Soviets at first rejected this offer.

Negotiations continued in various fora until finally, in 1963, Soviet interest in a ban that did not deal with underground tests emerged, even though they had rejected the U.S./U.K. offer previously. As a result, the United States, United Kingdom, and the U.S.S.R. agreed to the more limited goal of banning nuclear tests in all media except underground. This led to the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, usually referred to as the Limited Test Ban Treaty (LTBT).

While discussions continued in the 18 nation Committee on Disarmament, there was little further movement toward limiting underground nuclear tests until the 1974 summit meeting between the United States and the U.S.S.R. While the Soviets had originally called for negotiations on a comprehensive test ban, they agreed to consider a threshold treaty for underground nuclear testing. The threshold was to have been in terms of yield or possibly seismic wave magnitude. The United States initially proposed limiting tests to a certain value in body wave magnitude, but because body wave magnitude for a particular value of yield varies with test site location, the focus of the discussions was changed to yields. While this resolved the problem of the variability of body wave magnitude measurements, it introduced the problems associated with the accuracy of seismic techniques for the determination of yield. The TTBT was signed by the United States and the U.S.S.R. in July 1974.

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[1] See *Geneva Conference on the Discontinuance of Nuclear Weapons Tests: History and Analysis of Negotiations* (Department of State publication 7258, 1961).

The TTBT and its associated Protocol contain provisions for the exchange of geophysical data and announcing the yields of two explosions for calibration purposes in each geophysically distinct area (provisions which have not been implemented because the treaty has not been ratified). However, the treaty provides no mechanism by which one party could independently validate the accuracy of the data provided by the other party. Seismic techniques are inadequate to verify effectively the yields of Soviet tests. Prior to the signing of the TTBT, U.S. policy, as well as seismic research, had concentrated on a comprehensive test ban. Seismic research had been aimed at the problems of detecting and identifying low-yield nuclear tests with relatively less emphasis on determining yield.

While progress has been made in understanding the natural processes that affected yield estimation based on remote seismic measurement, the uncertainties in the yield estimation process cannot be sufficiently reduced without direct measurement of yields at the Soviet test sites. The Soviets, and some critics of existing U.S. policy in this country, have asserted that adequate verification will result from the exchange of data called for in the treaty. However, these data will be of limited value for verification purposes unless they can be independently verified by the United States. Even if the data were accurate and could be verified, they would not be sufficient to effectively verify Soviet compliance with the 150 kt. threshold of the TTBT, because the limited data to be exchanged would not reduce the uncertainty in the seismic yield estimation process to acceptable levels.

The question of peaceful nuclear explosions (PNEs) was also addressed during 1971–74 and continued until the Treaty on the Limitation of Underground Nuclear Explosions for Peaceful Purposes, usually referred to as the Peaceful Nuclear Explosions Treaty (PNET), was signed in 1976. Since each individual nuclear explosion could not be greater than 150 kt. additional monitoring measures had to be negotiated for explosions conducted at locations other than at the designated weapons test sites for salvos of explosions whose aggregate yield exceeded 150 kt. Provisions were included for onsite measurements of each explosion by downhole instrumentation, similar in result to the current CORRTEX [Continuous Reflectrometry for Radius versus Time Experiment] equipment, if the aggregate yield was planned to exceed 150 kt. Seismic instruments were also to be allowed in the test area if the aggregate yield was planned to exceed 500 kt. It is worth noting that even if the PNE Treaty were in force, the onsite measures would not have been implemented up to now because the Soviets apparently have not planned group explosions over any particular treaty-specified threshold which would trigger onsite inspection or installation of U.S. devices on Soviet territory.

Technical discussions on nuclear testing issues, principally related to a comprehensive test ban (CTB), have been held with the Soviets in the multilateral arena in Geneva. The United States presented papers at the Conference of the Committee on Disarmament (CCD) at least as far back as 1971 and again in 1973 and 1976. These papers discussed capabilities for discriminating between explosions and earthquakes, data from arrays of seismometers and networks of such stations, and various other seismology topics. There was, however, not much expert discussion of these U.S. contributions until the Ad-Hoc Group of Scientific Experts was formed in 1976.

One of the tasks of the Ad-Hoc Group of Scientific Experts was to describe a network of seismic stations that would provide data to the members for use in monitoring a CTB. Initially the Swedes, among others, attempted to establish a deliberative body within the CCD to conduct verification analyses. The United States did not want to rely on such a multinational group for verification decisions. As an alternative, the CCD, on the recommendation of the United States, formulated a plan for the exchange of seismic data and for conducting studies relating to those data. The Ad-Hoc Group of Scientific Experts selected an optimum network of seismic stations from CCD member states and evaluated its capability to provide data adequate for verification. An elaborate set of data parameters was agreed upon for reporting in a bulletin format. The World Meteorological Organization telegraph system was adopted for the exchange of these data bulletins. The exchange of complete seismograms, using digital techniques and satellite transmission, has been explored. Studies and experiments on these transmission techniques continue at the present time. It is significant, however, that throughout this period in which testing limitations have been of such concern, at no time have there been any joint projects of bilateral exchanges of data except for some limited discussions during the actual trilateral CTB negotiations.

In the summer of 1977, about 1 year after the conclusion of the PNE phase of the threshold treaty, the United States, the United Kingdom, and the U.S.S.R. began negotiations toward a comprehensive test ban. Initially, the United States and the U.S.S.R. had different views concerning the proposed duration of the treaty—the United States wanted a treaty of unlimited duration while the U.S.S.R. wanted a 3-year treaty that would continue depending on the actions of others, specifically France and China. By the summer of 1978, the United States revised its position and proposed a CTB of only 3 years duration.

Initially, the questions of seismic stations (numbers, kinds, and locations) were fairly open on both sides. As the negotiations on the number of seismic stations proceeded, the Soviets hardened their position on in-country seismic stations—demanding that they had to be nationally manned. The Soviets constantly raised their concern about unmanned stations or "black boxes." The United States eventually proposed 10 seismic stations in the Soviet Union in conjunction with a 3-year treaty. The U.S.S.R. said they would accept 10 stations in the U.S.S.R. provided that there would be 10 stations in the United States and 10 stations in the United Kingdom and its territories. This created a serious impasse. The United States and the United Kingdom felt that one station in the limited territory of the United Kingdom would be sufficient, but the Soviets would not budge. They took the position that equal participation required equal responsibilities. They further indicated that if 10-10-10 was not satisfactory, any other set of equal numbers would be acceptable. While the Soviets had apparently agreed in concept to both onsite inspection and incountry seismic stations, these issues were still unresolved when the negotiations were suspended in November 1980.

The United States has not resumed the trilateral CTB talks since they recessed in November 1980 because under present circumstances a CTB would be against the security interests of the United States and its allies and would not be effectively verifiable. In the existing environment, the security of the United States and our allies depends on a credible U.S. nuclear deterrent. In such a station, where we must rely upon nuclear weapons to deter aggression, nuclear testing will be required. A comprehensive test ban remains a long-term objective of the U.S. arms control policy, but such a ban must be viewed in the context of a time when we do not need to depend upon nuclear deterrance to ensure international security and stability, and when we have achieved deep, broad, and verifiable arms reductions, improved verification capabilities, expanded confidence-building measures, and a greater balance in conventional forces.

The verification of a comprehensive test ban, and especially any testing moratorium such as proposed by the Soviet Union, remains a major problem. In the context of the verification procedures discussed (but not agreed) in the CTB trilateral negotiations, there would still be significant uncertainty about our ability to verify Soviet compliance, that is, to detect and identify with sufficient certainty a potentially significant level of clandestine testing. Our concerns are heigthened by likely Soviet violations of the TTBT and by Soviet violation of the Limited Test Ban Treaty, the LTBT.

IV. Opportunity for cooperative measures

There are two distinct problem areas that can be addressed jointly by the United States and the U.S.S.R. The first deals with sufficiently accurate yield measurements that would allow effective verification of yield thresholds such as the 150 kt limit of the TTBT. Solution of this problem area would provide the basis for moving forward on ratification of the TTBT and the PNET. The second deals with the ability to detect and identify low-yield nuclear tests. This requires solution of the problem of detecting and identifying low-yield tests not only underground but also underwater, in the atmosphere, and in outer space. Programmed capabilities will greatly enhance our ability to detect and indentify low-yield nuclear tests within the atmosphere, although there may remain some uncertainty regarding the country conducting such tests if they are conducted over remote areas. With these technological advances in hand and at a time when we do not need to depend upon nuclear deterrence to ensure international secrity and stability and when we have achieved deep, broad, and verifiable arms reductions, expanded confidence-building measures, and a greater balance in conventional forces, the conditions would exist for proceeding toward a treaty that would ban low-yield nuclear tests.

a. Verification of yield thresholds.—As noted above, the provisions of the TTBT provide no mechanism for reducing the level of uncertainty of yield estimation to an acceptable level. (We believe that no method of yield estimation based only on information derived solely from seismic measurements or seismic theory can reduce the uncertainty to an acceptable level.) Uncertainties in the yield estimation process cannot be sufficiently reduced without directly measuring the yield of Soviet tests with instruments which are fundamentally much more accurate than seismic methods.

The President has stated that he is prepared to move forward on ratification of the TTBT and PNET if the Soviets would agree to the use of an effective verification system incorporating the CORRTEX method.

The most productive joint Soviet-U.S. discussions of monitoring measures would be those which would involve the technology and implementation procedures for direct yield measurement. The United States believes that it has identified in CORRTEX a measurement technique which will reduce the uncertainty in yield measurement to an acceptable level and will do so without danger of compromising other sensitive information about the nature or performance of the nuclear device whose yield is to be measured.

CORRTEX is a hydrodynamic yield measurement technique that measures the rate of propagation of the underground shock wave from an explosion. This technique uses an electric coaxial cable located in the device emplacement hole or in a nearby, parallel "satellite" hole. When the nuclear device is detonated, a shock wave propagates through the ground, crushing and shortening the cable. The rate by which the cable length changes is recorded by measuring the changing transit times of low energy electrical pulses sent down to and reflected from the cable end. This rate is a measure of the propagation velocity of the explosive shock wave through the ground which is, in turn, a measure of the yield of the nuclear explosion.

The electronic device that provides the timing signals is a battery-powered, suitcase-seized unit that may be remotely controlled. All equipment for power, recording, and data reduction can be contained in a small trailer.

CORRTEX has been shown to be accurate to within 15% (with 95% confidence) of more direct, radiochemical yield measurements for tests with yields greater than 50 kt. This is based on its use at the Nevada test site in over 100 tests with the sensing cable in the device emplacement hole and four tests with the sensing cable in a satellite hole. The accuracy of the technique is believed to be relatively independent of the geologic medium provided the satellite hole measurements are made in the "strong shock" region near the nuclear explosion. At greater separation distances, the medium becomes more important. A satellite hole separation distance of 14 meters (46 feet) is appropriate for a test near 150 kt.

CORRTEX is expected to be initially accurate within 30% (with 95% confidence) of the actual yield at Soviet test sites for tests above 50 kt. An accuracy of 30% of the actual yield means, for example, that a test that produces CORRTEX measurements estimated to be associated with a "central value" yield of 150 kt, could, with a 95% probability, have a yield as high as 195 kt (150 kt plus 30% of 150 kt) or as low as 105 kt (150 kt minus 30% of 150 kt).

The Soviets were exposed to technology similar to CORRTEX during the PNET discussions. At that time, they indicated that they possessed similar technology. Therefore, a technical basis has already been established for the necessary discussions. The United States is prepared, as evidenced by the President's March 1986 offer, to demonstrate to Soviet technical experts how we would emplace CORRTEX instruments, how measurements are recorded, and how the data are analyzed. In any cooperative technical effort, the Soviet experts would have the opportunity to examine the CORRTEX data from a Soviet nuclear test in order to determine for themselves that no sensitive information, not relevant to TTBT verification, has been compromised. For their part, the Soviets would be permitted to bring any equipment they deemed necessary to measure the yield of the test.

Successful implementation of a direct-yield measurement regime for verification of the TTBT and the PNET will extablish the principle of onsite inspection at declared facilities—in this case the site of nuclear tests. Joint Soviet-U.S. discussions to establish direct yield measurements will necessarily require negotiation of all the logistical aspects of such onsite presence, including the size and composition of the technical teams who would make measurements; agreement on the quantity of equipment which can be brought into the country; identification of allowed instrumentation; inspection of equipment by the party whose test is to be measured; establishment of housing, feeding, and transportation arrangements for the team making measuremaents; and procedures for sharing and transferring data from the country in which the test is to be performed.

Though not exhaustive, the above issues that would require negotiation are indicative of the long list of issues which must be addressed in making the transition from an agreement in principle to onsite inspection implementation. Any one of these elements, if not properly resolved, could frustrate the ultimate objective of the inspection regime. While not as glamorous as some aspects of arms control, the negotiation of such technical and logistical details is critical and may be extremely time consuming. Therefore, early joint Soviet-U.S. discussion of these issues can have a major impact on timely ratification of the TTBT and PNET.

b. Detection and Identification of Low-Yield Nuclear Tests. The second problem area, detection and identification of low-yield nuclear tests, is even more difficult because the solution requires effective monitoring in all environments—underground, underwater, in the atmosphere, and in outer space. Consequently, verification of any limitation of low-yield nuclear tests would require, at a minimum, the utilization of several techniques.

For example, detection and identification of low-yield nuclear tests will necessitate installation of an in-country seismic network and the implementation of onsite inspections. In addition, regional seismology (operating distances up to 2,000 kilometers from the source) will be a critical technology for the detection of underground tests. Measurement techniques for the collection and detection of atmospheric nuclear explosion debris will still require some refinement when working at our near levels of naturally occurring background radiation. Further development of hydroacoustic techniques could contribute to detection of small nuclear tests in remote ocean areas.

Recognizing the full scope of the problem of detecting and identifying low-yield nuclear tests in all environments, which must be solved, this paper will address only one part of the problem—monitoring low-yield *underground* nuclear tests—because this is the area where the United States believes that cooperation with the U.S.S.R. would be the most productive.

The requirements for in-country monitoring stations have been discussed with the Soviets in many fora since the late 1950s (see the "Historical Perspective" section). There remain several areas in which seismic monitoring can be profitably addressed by Soviet and U.S. technical experts. Further work may strengthen the basis for seismic detection and identification of low-yield nuclear tests in advance of the achievement of the other criteria which must be met before the United States could consider a comprehensive test ban to be in its national interest.

It is assumed that whatever the level of detection of seismic events, there will be some events detected whose origin (e.g., nuclear test, earthquake, chemical explosion) will be uncertain—unidentified (i.e., unresolved as to their origin) events. While improvements in seismic monitoring devices could be expected to provide additional data that could identify some of the events that cannot be identified at current sensitivity levels, the net effect of improvements in sensitivity will be to increase the number of unidentified events.

Onsite inspection, as a concept, is also used to describe inspections conducted to remove ambiguity when information form other sources indicates that a potential violation of a treaty in force may have already occurred. However, onsite inspection will only be useful when the precise location of the ambiguous event can be determined. Onsite inspection could contribute to identification of the source of surface or near-surface explosions, where surface disturbances would clearly indicate the location. For small underground explosions, it would be nearly impossible to locate the source with sufficient precision to permit the verifying party to drill into the cavity created by the test to sample the explosion debris.

The basic elements which could be addressed in joint discussions include the fundamental science of the transmission of seismic waves within the Soviet Union; the types of equipment which would need to be permanently installed for the measurement of seismic data; the equipment which would need to be installed for the recording and transmission of seismic data to national data analysis centers; and the numercial data-processing techniques which would be used for identifying the source of a seismic event based on the characteristics of the seismic data. These issues are described in more detail below:

Seismic Wave Transmission: The United States is actively pursuing the seismic research which would be oritical to the detection and identification of low-yield (below 10 kt) nuclear tests. Of particular significance is research on high-frequency seismic waves. Instruments capable of detecting high-frequency seismic waves have been developed and an experimental seismic array containing such equipment is in operation. To be confident that high-frequency seismic waves can be useful for detection and identification of low-yield nuclear tests, two issues need further study: the availability of sufficiently quiet, low background seismic noise sites within the Soviet Union at which seismic stations could be located and knowledge of the transmission characteristics of high-frequency seismic waves within the Soviet Union.

The degree to which seismic wave energy is absorbed and scattered as a seismic wave travels away from a nuclear explosion in the United States has been studied extensively, and much of this work has been published in the scientific literature. Similar information is not available for explosions within the Soviet Union. A joint U.S.-Soviet effort could seek to determine the degree to which high-frequency seismic wave energy is absorbed and scattered in the Soviet Union. Such an effort would establish a more realistic basis for the utility of high-frequency seismic waves for detection and identification of low-yield nuclear tests. While data obtained from outside the Soviet Union are useful, Soviet-U.S. cooperation in obtaining and evaluating data from within the Soviet Union is essential.

Seismic Equipment and Data Handling. During the trilateral CTB negotiations of 1977–80, the United States described to the Soviet Union tamper-proof, remotely operated seismic stations which would record and transmit seismic data for analysis in the United States. The United States has continued research on such stations. Modification in these stations would be required to provide the capability to record and transmit data on high-frequency seismic waves. Joint Soviet-U.S. efforts could resume on the criteria for the location and operation of such stations to include characterization of the sites which would have to be available to ensure accurate instrument operation. Such an effort would have to include data gathering from potential sites for remote stations in the Soviet Union and should include installation of research instruments to validate that such instruments can operate reliably, to include data transmission, throughout the broad range of environmental conditions within the Soviet Union.

Seismic Wave Analysis: The effectiveness of any low-yield underground nuclear test verification regime based upon the analysis of seismic waves will ultimately depend on the ability to identify a nuclear explosion by distinguishing between nuclear explosions and other sources of seismic energy, e.g., chemical explosions and earthquakes. The object must be to minimize the number of recorded seismic events whose source is ambiguous. A joint Soviet-U.S. effort could seek to identify analytic techniques which would positively identify the origin of recorded seismic signals. Such a joint study cannot be done in the abstract but should be tested against real data which would be typical of that which would be recorded by instruments located at the prospective location of seismic stations. No analytic technique can hope to eliminate all ambiguous events, but it would be very helpful if the two sides could agree on which technique can be most effective.

V. Current status

We have sought on a number of occasions in the past several years to engage the U.S.S.R. in discussions on verification improvements in the nuclear testing area but thus far without success. In 1983 the U.S. Government sought on three separate occassions to engage the Soviet Union in a discussion of essential verification improvements for the TTBT and the PNET. In September 1984 the President proposed in his address to the UN General Assembly that the United States and the Soviet Union find a way for Soviet experts to come to the U.S. nuclear test site and for U.S. experts to go theirs to measure directly the yields of nuclear weapons tests. In July 1985 the President expanded his offer with an unconditional invitation for Soviets experts to go the U.S. nuclear test site to measure the yield of a U.S. nuclear test with any instrumentation devices they deemed necessary. There was no requirement for a reciprocal visit by U.S. experts to a Soviet test site. In December 1985 President Reagan proposed to General Secretary Gorbachev that U.S. and Soviet experts on nuclear testing limitations meet in February 1986 to discuss our respective verification approaches and to address initial tangible steps to resolve this issue.

Most recently, on March 15, 1986, the President urged the Soviet Union to join the United States in discussion on finding ways to rearch agreement on essential verification improvement of the TTBT and PNET. In this respect he provided details to the Soviet Union on the U.S. CORRTEX hydrodynamic measurement system and proposed that General Secretary Gorbachev send Soviet scientists to our Nevada test site during the third week of April 1986 to fully sxamine CORRTEX. At that time, the Soviets could also monitor a U.S. nuclear test. Finally, the President indicated that, if the Soviet Union will join us in an agreement for effective verification, including the use of CORRTEX, the United States would prepared to move forward on ratification of the TTBT.

The Soviets have stated that they have developed and have available a system that is used to obtain data similar to that obtained by CORRTEX. Aside from this assertion, the Soviet Union has not responded to any of the above U.S. initiatives, which were aimed at constructively addressing our mutual concerns.

VII. TEXT OF RESOLUTIONS OF RATIFICATION

THRESHOLD TEST BAN TREATY

Resolved (two-thirds of the Senators present concurring therein) that the Senate advise and consent to ratification of the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Weapon Tests, and the Protocol thereto, signed in Moscow on July 3, 1974, subject to the following reservation and declaration:

Reservation

The advice and consent of the Senate to ratification of the Treaty on the Limitation of Underground Nuclear Weapon Tests is subject to the condition that the President shall not proceed with ratification of this treaty until he has certified to the Senate that the

Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty on Limitation of Underground Weapon Tests, including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, so that the limitations and obligations of these treaties, inter alia the 150-kiloton limit, are effectively verifiable.

Declaration

The Senate declares its support for the President's commitment of October 10, 1986, to propose, upon ratification of the Treaty on the Limitation of Underground Nuclear Weapon Tests and the Protocol thereto singed in Moscow on July 3, 1974 and the Treaty on the Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto, signed in Washington and Moscow on May 28, 1976, immediate negotiations with the Soviet Union on further testing constraints, consistent with the commitment made by each party in Paragraph 2 of Article I of the Treaty on the Limitation of Underground Nuclear Weapons Tests to "limit its underground nuclear weapons tests to a minimum" and the obligation of the two parties in Paragraph 3 of Article I to "continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapons tests."

PEACEFUL NUCLEAR EXPLOSIONS TREATY

Resolved (two-thirds of the Senators present concurring therein) that the Senate advise and consent to ratification of the Treaty between the United States of America and the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes, and the Protocol thereto, singed in Washington and Moscow on May 28, 1976, subject to the following reservations and declaration:

Reservation

The advice and consent of the Senate to ratification of the Treaty on Underground Nuclear Explosions for Peaceful Purposes is subject to the condition that the President shall not proceed with ratification of this treaty until he has certified to the Senate that the Union of Soviet Socialist Republics has concluded with the United States additional agreements expanding upon the obligations stated in Article II of the Treaty on Limitation of Underground Weapon Tests, and the Protocol thereto, signed in Moscow on July 3, 1974, including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, so that the limitations and obligations of these treaties, inter alia the 150-kiloton limit, are effectively verifiable.

Declaration

The Senate declares its support for the President's commitment of October 10, 1986, to propose, upon ratification of the Treaty on the Limitation of Underground Nuclear Weapon Tests, and the Protocol thereto, signed in Moscow on July 3, 1974, and the Treaty on the Underground Nuclear Explosions for Peaceful Purposes and the Protocol thereto, signed in Washington and Moscow on May 28, 1976, immediate negotiations with the Soviet Union on further testing constraints, consistent with the commitment made by each party in Paragraph 2 of Article I of the Treaty on the Limitation of Underground Nuclear Weapons Tests to "limit its underground nuclear weapons tests to a minimum" and the obligation of the two parties in Paragraph 3 of Article I to "continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapons tests."

ADDITIONAL VIEWS OF SENATORS KASSEBAUM, EVANS, AND HELMS

During consideration of the Threshold Test Ban Treaty (TTBT) and the Peaceful Nuclear Explosions Treaty (PNET), the Foreign Relations Committee agreed, by voice vote, to report favorably a resolution offered by Senators Kassebaum, Evans, Helms, Lugar, McConnell, and Trible.

The resolution is in the form of an executive resolution stating that it is the sense of the Senate that the President should expand on the verification provisions in the TTBT and PNET with an agreement including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, or equivalent enhanced verification methods. It also recommends that the President communicate to General Secretary Gorbachev that the United States is committed to the TTBT and the PNET and that it desires an agreement for effective verification in 1987.

It is our intent that the two treaties, in their present form, remain on the Senate calendar and the executive resolution be offered in lieu of any resolution of ratification until the entire text of the treaties, as they are to be ratified, are before the Senate.

By considering the TTBT and PNET at this time, the committee finds itself in a peculiar situation, a situation Chairman Pell has commendably tried to resolve. We believe all members of the committee share the same objectives with respect to these treaties; we differ only in how best to achieve our objectives.

The TTBT and the PNET have been before the Senate for advice and consent since 1976. The Foreign Relations Committee considered the two treaties in 1977, ordered them reported favorably, but delayed reporting to allow another treaty to take precedence on the executive calendar. The two treaties have remained on the committee's calendar ever since. In the intervening years, questions have been raised concerning the adequacy of the verification provisions of the treaties. President Reagan informed the Senate that he would ratify the TTBT and PNET only if additional effective verification provisions can be negotiated. Initially, the Soviet Union refused to discuss amendments until the basic treaties have been ratified. However, in the summer of 1986, they agreed to talks among experts on a range of nuclear testing issues, including verification of TTBT and PNET. A number of meetings have been held since that time.

As President Reagan left for his meeting with General Secretary Gorbachev in Reykjavik in October 1986, a conference committee was considering different nuclear testing provisions contained in each chamber's version of the defense authorization bill. The House provision would have bound the United States to a 1-year moratorium on nuclear tests over one kiloton under certain conditions. The Senate's version was nonbinding, calling for ratification of the TTBT and PNET and resumption of talks on a comprehensive test ban (CTB). The Senate version also invited the President to submit any reservation he believed necessary for ratification of these treaties. The administration opposed both measures.

To break the impasse on the defense bill and to leave the President free to deal with General Secretary Gorbachev, a compromise was reached. The Congress accepted the Senate provision in exchange for Presidential assurances which were contained in an October 10 letter from President Reagan to the chairmen of the authorizing committees. The President agreed as follows:

> (1) To make ratification of these treaties a first order of business for the Congress, with an appropriate reservation to the treaties that would ensure they would not take effect until they are effectively verifiable. I will work with the Senate in drafting this reservation.
>
> (2) Once our verification concerns have been satisfied and the treaties have been ratified, I will propose that the United States and the Soviet Union immediately engage in negotiations on ways to implement a step-by-step parallel program—in association with a program to reduce and ultimately eliminate all nuclear weapons—of limiting and ultimately ending nuclear testing.

In an effort to live up to their part of the compromise, the administration offered the Senate a two-step approach that is unnecessarily complex: One, the first vote would give the Senate's advice and consent to the treaties but prohibit ratification until further agreement on verification is reached; and two, the second vote would give the Senate's advice and consent to the completed treaties. Under this procedure, the first Senate advice and consent would be a hollow exercise.

Chairman Pell offered an alternative: A resolution of ratification with reservation that does not call for immediate ratification of the two treaties but recommends ratification after further agreements on verification are negotiated. Under this approach, the Senate would not give its advice and consent to the text of the completed treaties, in essence, requiring the Senate to relinquish its constitutionally mandated role to advise and consent to treaties.

We believe it is a mistake to proceed in this manner. We cannot, in good conscience, abandon our responsibilities as Senators to advise and consent to the specifics of a treaty. To give our advice and consent to treaties without knowing their final form is an ominous and dangerous step in the wrong direction.

Therefore, we joined our colleagues in offering the only logical approach possible. Our sense of the Senate resolution is a simple, straightforward approach that can command a large majority of the Senate, if not unanimity. An overwhelming Senate vote will send the strongest possible message both to this administration and to the Soviet Union that the United States Senate is committed to the objectives and obligations of these treaties and wants to see them ratified, but not before adequate verification provisions are negotiated. The resolution urges the President to expand upon the verification of the TTBT and PNET while preserving the Senate's prerogative to advise and consent when the treaties are ready for ratification.

We believe the committee's vote to report this resolution favorably is a clear indication of the desire of the committee to offer our Senate colleagues a sound alternative should this matter come before the full Senate for consideration. We will press vigorously for adoption of our resolution at such time.

ADDITIONAL VIEWS OF SENATOR JESSE HELMS

I

the Threshold Test Ban Treaty or "TTBT" is seriously flawed. Almost all experts in the field of arms control agree that the TTBT is not effectively verifiable as it now stands. The administration has taken the position that further negotiations with the Soviet Union are needed in order to establish the procedures for effective verification.

Because of the agreement that the President made with unilateral disarmers in Congress at Reykjavik that he would ask the Senate for advice and consent for ratification of the TTBT, we are faced with the problem that the Senate is being asked to vote for a "pig in a poke." The Senate does not know whether the yet to be negotiated and agreed TTBT verification protocols will be effective, and thus the Senate cannot abdicate its constitutional duty to give its advice and consent to these new protocols. Verification is the main issue in our deliberations over the TTBT, so the Senate must insist on doing its constitutional duty to give its advice and consent on verification.

If we go ahead and vote for the present treaty without the verification procedures being spelled out, the U.S. negotiators will be under tremendous pressure to come up with an agreement whether it is effective or not; by the same token, the Soviets will have no reason to negotiate fairly, because they will be able to mount a propaganda campaign against the United States claiming that the TTBT has been ratified, but the United States is stalling. The national security of the United States is too important to submit to this kind of propaganda pressure.

For this reason, it has been the position of many Senators, including the senior Senator from North Carolina, that any ratification of the treaty now would not protect the proper responsibility of the Senate to give advice and consent to the treaty, since we do not have before us the whole treaty. We do not have negotiated or agreed to the key part of the treaty—the part pertaining to effective verification. It has been my position, and the position of many others, that a second ratification vote is necessary for the verification procedures, with the treaty not taking effect until those procedures have received the advice and consent of the Senate.

The reason that the second ratification vote on verification is so important is that the administration has already stated that there are "likely" violations by the Soviets of the 150-kiloton constraint in the treaty. Moreover, unclassified information provided to this committee by the Department of Defense and the Arms Control and Disarmament Agency shows that the Soviets have conducted over 24 nuclear explosions that violate the 150-kiloton limit. To vote its advice and consent to ratify this treaty as it stands, under these circumstances, would, in my opinion, be a dereliction of the Senate's duty to protect the national security.

Our distinguished colleague, Senator Kassebaum, has proposed the best solution to our protracted problems with the proposed ratification of the TTBT. Our other distinguished colleague, Senator Evans, has collaborated with Senator Kassebaum in this endeavor. I congratulate both of them on their genius for finding an elegantly simple and correct solution to such a difficult problem. I am honored to be a cosponsor of the Kassebaum-Evans-Helms executive resolution on the TTBT, printed here as follows:

KASSEBAUM/EVANS/HELMS RESOLUTION ON THE THRESHOLD TEST BAN TREATY AND PEACEFUL NUCLEAR EXPLOSION TREATY

> Whereas the Senate has asked the President to seek advice and consent to ratification of the Threshold Test Ban and Peaceful Nuclear Explosions Treaties;
>
> Whereas effective verification is an essential element of any arms control agreement;
>
> Whereas the President believes that the TTBT and PNET are not effectively verifiable. Now therefore be it
>
> *Resolved*, That it is the sense of the Senate that:
>
> (1) The President should seek to expand upon article II of the TTBT with an agreement including provisions for direct, accurate yield measurements taken at the site of all appropriate nuclear detonations, or equivalent enhanced verification methods;
>
> (2) The President should communicate to General Secretary Gorbachev that the United States is committed to the TTBT and PNET and that it desires an agreement for effective verification in 1987.

This resolution solves the constitutional problem that has delayed our consideration of these related TTBT and PNET treaties. This constitutional problem relates to the Senate's "explicit duty" to give its advice and consent to any treaty, in order for the President to ratify the treaty.

A little background is necessary now. President Reagan has been attempting to negotiate effective verification for the TTBT since 1983 with the Soviet Union. The President has been sincerely trying to fix the TTBT for over 4 years. As the resolution points out, President Reagan believes that the TTBT is not effectively verifiable. That is, the President believes that the Soviets are likely to have violated the TTBT, but the United States does not yet have conclusive enough evidence of these Soviet TTBT violations. But I repeat, President Reagan has been trying for over 4 years to achieve Soviet agreement to added provisions to the TTBT which would make it effectively verifiable.

Last October, the unilateral disarmament bloc in Congress tried to dictate to our President. President Reagan was already in Reykjavik, Iceland, for a summit meeting with Soviet leader Gorbachev centered on arms control. The unilateral disarmament bloc in Congress forced our President into agreeing to seek ratification of the flawed TTBT, in exchange for dropping congressional attempts to legislate a binding U.S. unilateral moratorium on nuclear weapons testing and also binding legislation codifying U.S. compliance with the SALT II Treaty. These efforts would have resulted in American unilateral disarmament, surely a dangerous idea.

The President was already in Iceland sincerely seeking to negotiate arms control with the Soviet Union, but his critics in Congress were trying to tie his hands at this crucial moment by legislating American unilateral disarmament. Under this congressional dictation to our President in the face of our Soviet adversaries and in full view of the watching world, President Reagan was forced to agree to seek ratification of the flawed TTBT. But the President wisely reserved the right to propose to the Senate a reservation to the TTBT, focused on negotiating a further agreement with the Soviets on effective verification improvements, and with the right of the Senate to make a second ratification vote on the negotiated verification agreement.

I would remind my colleagues that the Reagan administration has found for the last 4 years that the Soviets are "likely" to have violated the TTBT on about 24 instances. Our distinguished colleague, Senator McClure, former chairman of the Senate Energy Committee and an acknowledged Senate expert on arms control, has recently presented the most complete unclassified analysis available of the administration's own TTBE violations findings. This analysis appears as appendix I.

Moreover, I have just been reliably informed on an unclassified basis that President Reagan has once again reaffirmed this year the finding first made 4 years ago on January 23, 1984, that the Soviets are "likely" to have violated the TTBT.

KASSEBAUM/EVANS/HELMS RESOLUTION

So here we are. President Reagan fulfilled his end of the Reykjavik bargain with the unilateral disarmers in Congress on the TTBT—he submitted his reservation to the TTBT to the Senate on January 13, 1987. President Reagan's reservation called for "direct, accurate yield measurements on the Soviet test sites," and in addition, it called for a second Senate vote on its advice and consent to Presidential ratification of any effective verification agreement negotiated with the Russians. This second Senate vote would be absolutely necessary; otherwise the Senate would be giving in advance its advice and consent for the President to ratify any verification agreement he might be able to achieve with the Soviets, no matter how inadequate. It would be contrary to the Senate's constitutional duties for the Senate to agree in advance to an unspecified verification agreement. Such a procedure would be unconstitutional, unwise for our national security, and a dangerous precedent eroding the Senate's duties and prerogatives under the treatymaking powers. It would be asking the Senate to buy a "pig in a poke." But some of my distinguished colleagues have rejected the President's reservation, only because it calls for the Senate to exercise its constitutional duty to give its advice and consent a second time to the specific verification agreement achieved.

Given this impasse, I believe we should treat the TTBT ratification process in its proper sequence. The Kassebaum-Evans-Helms resolution calls for the President to negotiate first an effective verification agreement with the Soviets, during 1987, and only then, after the agreement is achieved, to submit this new agreement along with the TTBT and the related PNET, for the Senate to give its advice and consent on the whole package. This is the correct way for the Senate's constitutional treatymaking powers to be working—the President negotiates first, and then the achieved agreement is submitted to the Senate for its advice and consent to the resulting treaty.

I support the Kassebaum-Evans-Helms resolution, and I urge my colleagues to vote for it as the best solution to our impasse over the TTBT.

II

The fundamental problem with the TTBT lies in the deep concerns of experts about TTBT verification and the military advantages the Soviets have achieved from their violations.

SOVIET TTBT VIOLATIONS LIKELY OR CERTAIN

President Reagan stated correctly on March 28, 1983, that: "We have reason to believe that there have been numerous [Soviet] violations" of the TTBT. I thoroughly agree with President Reagan.

In June 1983, Secretary of State Shultz testified to this committee that the Soviets had tested nuclear weapons about "double" the 150-kiloton threshold of the TTBT—at about 300 kilotons.

President Reagan has reported to Congress four times since January 23, 1984, that the Soviets are "likely" to have violated the TTBT. The administration's fifth report to Congress on Soviet arms control treaty violations is still overdue, but I am informed on an unclassified basis that it will again reconfirm for a fifth time that the Soviets are "likely" to have violated the TTBT.

The Defense Department has strengthened its judgment, stating officially last year in "Soviet Military Power 1986" (page 145) that the Soviets have "probably" violated the TTBT. There have been 24 Soviet TTBT violations.

Our distinguished colleague, Senator McClure, has stated that there is virtual certainty that the Soviets have violated the TTBT.

This is because one Soviet nuclear weapons test had an estimated yield of 316 kilotons. Under our current agreed yield estimation methodology, we have a "factor of 2" uncertainty in our yield estimates. This means that any yield estimate is a median estimate, and that the actual yield could have been either twice or one-half the median. Considering our factor of 2 uncertainty with this yield estimate, this test could have been as high as 632 kilotons, or as low as 158 kilotons. Thus even the lowest bound of our uncertainty was higher than the 150-kiloton threshold. In sum, under our existing agreed methodology, there has been at least one violation, and this is a certain violation.

These Soviet TTBT violations are serious, important, and they are militarily significant. They have contributed greatly to the Soviet first-strike capability. They are a fundamental reason why the TTBT has had a negative impact on American national security.

ADDITIONAL FACTORS SUGGESTING SOVIET TTBT VIOLATIONS: VENTING

Soviet violations of the TTBT, combined with the lack of any verification guarantees, have caused the TTBT to become a symbol of the flawed premise of entering into an international arms control agreement before securing ironclad verification measures.

The Soviets have shown grossly inadequate caution in preventing venting of radioactive debris beyond their borders in violation of the 1963 Limited Test Ban Treaty—LTBT. There have been over 30 cases of clearcut Soviet venting of radioactive debris beyond their borders in violation of the LTBT. Indeed, about 50 percent of all Soviet underground nuclear weapon tests have either possibly, probably, or clearly vented radioactive nuclear debris beyond Soviet borders in violation of the LTBT. Thus there is a clear pattern of deliberate Soviet cheating on the most important existing nuclear weapons testing treaty.

But this illegal venting could easily be prevented, merely by boring a deeper test hole into the Earth. It is estimated, however, that the Soviets can save about one-half of their testing costs by not boring deeper holes to prevent venting.

Thus Soviet venting is probably not the result of mere carelessness. It probably results from a deliberate Soviet economy measure.

Why, therefore, should we assume that on a test which the Soviets have deliberately allowed to vent radioactive debris beyound their borders, the Soviets would simultaneously show enough concern about the TTBT 150-kiloton threshold to test below it? Indeed, if the Soviets are willing continuously and deliberately to violate the LTBT, with which they have a clear legal obligation to comply under international law, why would they not be even more willing to violate the TTBT 150-kiloton threshold, with which they have a somewhat more questionable legal obligation to comply pending its ratification?

Proponents of the view that the Soviets have not violated the TTBT are asking us to believe that on a Soviet test which has clearly vented in violation of the LTBT, the Soviets have simultaneously shown restraint and complied with the 150-kiloton threshold. This assumption defies logic, and is in fact ridiculous.

Restated, if the Soviets are unwilling to prevent venting in order to economize on their testing costs, they may also be willing to test above the 150-kiloton threshold for sound military reasons. Further, if the Soviets have been confirmed by the President in systematic and expanding violations of the SALT treaties and the chemical and biological warfare treaties and in fact all the existing arms control treaties, why would they be willing to show special concern in the area of TTBT compliance, especially when they have been confirmed in LTBT violations?

SOVIET SUPERIORITY IN NUCLEAR WARHEADS STEMS FROM TTBT VIOLATIONS

The Joint Chiefs of Staff Military Posture Statement for Fiscal Year 1988 states on page 10 that they are "changing significantly" toward superiority in nuclear warhead technology. This is an important and dangerous assessment by our top military leaders. Nuclear weapons are the key to deterrence of all war. It means at the very least that we must carefully scrutinize the military effects of the TTBT. Soviet high-yield testing in violation of the TTBT has probably enabled the Soviet Union to learn more than the United States about high-yield warheads that are ideal for a first strike against U.S. ICBM's.

MILITARY REASONS FOR SOVIET TTBT VIOLATIONS

Soviet military requirements could easily justify exceeding the 150-kiloton threshold. During the original TTBT negotiations in the spring of 1974, the sides discussed potential threshold levels. In March 1974, the Soviets proposed a threshold of between 500 and 750 kilotons. This is a little-known but extremely important piece of the negotiating record. This Soviet proposal strongly suggests that the Soviets themselves have long had a military requirement to test at yields from 500 to 750 kilotons. The majority of Soviet ICBM yields are now estimated to lie in the 300- to 600-kiloton range.

Soviet military requirements in fact closely match the Soviet negotiating proposal for a threshold of 500 to 750 kilotons. Soviet fourth generation MIRVed ICBM's first were flight-tested in 1972–73 and first deployed in 1975. They are estimated to carry MIRV warheads with yields of from 300 to 600 kilotons. There is further incentive for the Soviets to test at these yields. The new fifth and sixth generation Soviet ICBM's, the MIRVed SS-24, the MIRV-capable SS-25, and the Superheavy MIRVed SS-X-26 ICBM's, also have warheads estimated to be in the 300- to 600-kiloton range. Thus the Soviet have flight-tested three generations of MIRVed ICBM's with warheads in the 300- to 600-Kiloton range—a powerful incentive indeed for the Soviets to want to exceed the 150-kiloton threshold on underground nuclear weapons tests. We should be very surprised indeed if the Soviets did not in fact test their new warheads at full yield in this 300- to 600-kiloton range.

SOVIET EXPLOITATION OF THE UNITED STATES "FACTOR OF 2" UNCERTAINTY

In the published July–September 1977 Senate Foreign Relations Committee hearings on the TTBT, it was officially revealed for the first time that the United States had a "factor of 2" uncertainty in estimating the yields of Soviet underground nuclear weapons tests. This meant that, as I have noted, U.S. estimates of Soviet test yields had a median value, and a possible high value twice the median, and a possible low value one-half the median. The Soviet KGB and GRU Intelligence Services were surely present at these public hearings, so the Soviets were clearly aware of the bounds of U.S. estimative uncertainty regarding their yields.

This U.S. "factor of 2" uncertainty meant in practice that the Soviets could effectively double the yields of their tests, and still remain within the envelope of American uncertainty. The Soviets could double their yields by causing the United States to believe that perhaps their pre-July 1977 tests were at the lowest bounds of the U.S. uncertainty envelope, while their post-July 1977 tests could have seemed to be a upper bound of the U.S. uncertainty envelope.

This is precisely what the Soviets did. Beginning in late 1978 and early 1979, after the United States had changed its estimative methodology in Soviet favor for the fourth time, the Soviets in fact doubled their yields. All experts agree on this yield doubling. It is a conclusive fact. The problem is how to explain this fact and still argue that the Soviets have remained in compliance with the 150-kioloton threshold. Those who assume Soviet compliance despite this doubling argue that the Soviets may have been testing at one-half the allowed threshold, or at 75 kilotons, in the 1976–77 period, so that the 1978–79 doubling merely brought them up to the 150-kiloton threshold. But this is a highly unrealistic, even illogical assumption, based upon known Soviet arms control noncompliance in all other treaties. Much more reasonable is the explanation that the Soviets were testing at about 150 kilotons in the 1976–77 period, but doubled their yields to about 300 kilotons in the post 1978–79 period.

SOVIET DECEPTION TO REDUCE UNITED STATES ESTIMATES OF SOVIET WARHEAD ACCURACY AND YIELD

There are two components of missile lethality—warhead accuracy and explosive yield. Accuracy is much more important a factor in determining the threat of an ICBM than yield. According to press reports, the Soviets attempted to deceive the United States on the accuracy of their ICBM warheads between 1977 and 1980. The Soviets attempted this deception by digging false decoy ICBM reentry vehicle (warhead) impact craters at their Kamchatka impact area, and filling in the real craters. They reportedly did this at night, when U.S. observation was impaired; and the dummy warhead impact craters were placed further away from the presumed impact target, in order to suggest reduced accuracy. This activity was intended to deceive U.S. intelligence into underestimating Soviet ICBM accuracy, the key factor in achieving a first-strike capability. If the Soviets were willing to try to deceive the United States into underestimating their ICBM accuracy, they might also be inclined to try to deceive the United States into underestimating their warhead yields. After all, accuracy is by far the most important component of ICBM lethality.

While it is still classified, there is in fact parallel evidence that indeed the Soviets did attempt also to cause the United States to underestimate their warhead yields. I refer my colleagues to classified briefings on this matter, but it is not going too far to say that this evidence of Soviet yield deception occurred at the same time as the accuracy deception and the yield doubling, and is related to the Soviet use of their own type of the CORRTEX measurement system. The Soviets attempted to deceive the United States into halving its yield estimates, just when they doubled. What is the significance of evidence that the Soviets tried to encourage the United States to underestimate by one-half the yields just when they were doubling the yields of their underground tests of their ICBM warheads? This evidence is in fact further evidence that the Soviets have been exceeding the 150-kiloton threshold.

MAGNITUDE OF SOVIET TTBT VIOLATIONS

The Department of Energy has testified to the Senate that: "The ability to conduct occasional tests at 300 to 450 kilotons cannot at present be denied to the Soviets" under the TTBT. This is an unacceptable situation for U.S. national security. The Department of Energy stated further that a September 1980 Soviet high-yield test would have been 1 megaton, or 1,000 kilotons, using the U.S. estimative methodology in use when the TTBT was signed in July 1974. This test is still estimated to be 316 kilotons even after four U.S. methodology changes giving the Soviets the benefit of every doubt. As I have noted, even granting the factor of 2 uncertainty in this estimate of 316 kilotons, the September 1980 test was still at least 158 kilotons, or over the 150-kiloton threshold. This is a certain violation.

In order to give the United States some confidence that the alarm will be sounded when the Soviets violate the TTBT, we must now allow the Soviets to test at a considerably higher yield than even the 316-kiloton yield, a certain violation. An actual Soviet yield would have to be well above twice the 150-kiloton threshold limit before the odds were favorable that we would get a signal large enough to justify a substantive U.S. response. With present teleseismic verification procedures, the Soviets can conduct militarily significant violations from 300 to 450 kilotons with impunity. There have been some Soviet tests as high as 350 to 400 kilotons. As President Reagan stated correctly in a press conference on March 28, 1983, "We have every reason to believe there have been numerous Soviet violations of the TTBT." Dr. Harold Agnew, former director of the Los Alamos National Weapons Laboratory, stated that some Soviet "tests appeared to us to range as high as 400 kilotons, based on detection criteria in effect at the time of the initial agreement" on the TTBT in July 1974.

Even if effective verification procedures were accepted by Moscow, the Soviets have already achieved military advantages that strongly indicate that ratification of the TTBT would be inimical to U.S. security interests. Moreover, the TTBT severely constrains vitally necessary U.S. weapons testing, for both stockpile confidence and new offensive and defensive systems.

TTBT VIOLATIONS AND NEW SOVIET MISSILES

The Soviets are deploying two new type ICBM's, the roadmobile SS–25 and the railmobile SS–24, contrary to the SALT II Treaty's prohibition on no more than one new type ICBM. These new ICBM's have advanced warheads developed and tested in violation of the TTBT. They are defended by mobile SAM–12 ABM-capable interceptors, in violation of the SALT I ABM Treaty. The Soviets are now flight-testing the new superheavy SS–X–26 follow-on to the superheavy SS–18, which violates the SALT II Treaty by having more throw-weight than the SS–18 in order to carry more warheads, from 14 to 20 or more.

TTBT HANDICAPS U.S. STRATEGIC MODERNIZATION PROGRAMS

As result of U.S. compliance with the TTBT, the United States has been forced to use older, less advanced designs for the new MX and Trident II warheads. The warheads for the MX, Trident II, the Mark 12A, the new bomb carried on the B-52 and the B-1B bombers cannot be proof-tested at full yield under the TTBT. U.S. strategic deterrent systems have never been previously deployed with such uncertainties concerning their performance. The problem of the U.S. critical nuclear material shortage is also exacerbated by compliance with the TTBT, thereby limiting the U.S. ability to meet the growing Soviet threat. Besides requiring the use of older and less efficient designs for multibillion dollar strategic weapons, the TTBT limits the possible U.S. response to future Soviet military hardening programs. One feasible U.S. response to new Soviet ABM defenses and superhardened targets would be the development of higher yield weapons. But this is precluded by the TTBT. Moreover, by their violations of the TTBT and ABM Treaties, the Soviets are deploying defensive Break Out ABM systems nationwide. Meanwhile, U.S. TTBT compliance is constraining SDI testing, as a recent Presidential report to Congress revealed.

The Soviets have tested and will continue to test at slightly more than twice the maximum allowed yield calculated by the United States at any given time. Thus, if the United States takes action now to legitimize Soviet tests now estimated at 300 kilotons or more, the Soviets will soon be able to test at 600 kilotons.

The TTBT is adequately verifiable now, and using our best agreed verification methodology, we have verified conclusively Soviet violations. These violations are irreversible, and already give Moscow significant military advantages. The United States, moreover, has sound national security reasons for not ratifying the TTBT. The United States has clear military requirements for developing and testing weapons above 150 kilotons. If the current situation persists—in which the Soviets are probably testing at two to three times the treaty limit—the U.S. will continue to fall further and further behind the U.S.S.R. in strategic military power.

GREATER U.S. DEPENDENCY ON NUCLEAR TESTING

The United States depends on nuclear testing and nuclear forces more than the Soviet Union.

As Dr. Henry Kissinger stated in a speech in Brussels on September 1, 1979: "Our [US] strategic doctrine has relied extraordinarily, perhaps exclusively, on our superior strategic power. . . The United States throughout the postwar period has been more dependent on its strategic forces that the Soviet Union has been on its own."

This is true because of the following factors:

U.S. warhead designs depend more on high technology;

Lower U.S. missile throw-weight requires optimized warheads;

The United States demands higher safety and security standards than the U.S.S.R.;

The Soviets are hardening much more than the United States, and the United States must optimize our yield to weight ratios in order to keep increasingly harder Soviet targets at risk.

As Dr. Harold Agnew testified to this committee in 1977, if the TTBT were ratified, "our defense systems would eventually have to bear a penalty in payload weight, physical size, and perhaps even in the additional use of fissile materials."

Since 1977, there has been a significant increase in the requirements for new U.S. weapons with yields well above the 150-kiloton limit. By the end of the 1970's, it was clear that both the size of the Soviet threat and the greatly increased hardness of Soviet silos and other important military and political assets posed a fundamental new U.S. targeting problem. Both Presidential directive 59 and National Security Decision Directive 13 called for improved U.S. capabilities against hardened military targets. This action affected the yield requirements for both the planned MX and the Trident II. In the TTBT environment, this created a problem. Continued U.S. TTBT compliance will make it more difficult to meet foreseeable future weapons requirements. As Dr. Siegfried Hecker, director of the Los Alamos National Weapons Laboratory, testified to this committee, "it may be more difficult to meet foreseeable future requirements under the TTBT constraints." As noted, the TTBT has precluded U.S. full yield tests of new weapons, as well as stockpile reliability tests.

Over half of total U.S. nuclear weapons tests since 1976 have been constrained by the TTBT, and these have been the most important tests. There have been U.S. penalties and risks from TTBT compliance.

The link with direct test experience in the high-yield range thus is becoming increasingly tenuous. We are unable to fulfill some new weapons requirements. Dr. Hecker testified that the Soviets have probably already obtained a significant military advantage through clandestine violation of the TTBT. The present Soviet MIRV weapons have much smaller yields than those of the Soviet weapons deployed as of 1974, increasing the significance of the Soviet violations of the TTBT. The majority of Soviet ICBM yields are not in the 300- to 600-kiloton range, so a violation at the 300- to 450-kiloton level has powerful military significance. This is particularly true at a time when changes in the targets we must hold at rish may require entirely new, untested designs in the same yield range. The ability to conduct such tests cannot be denied the Soviets under the TTBT. Since both sides have strategic weapons requriements well in excess of this 150-kiloton limit, violation of the TTBT by the Soviets could create an asymmetry that has significant military implications. We have already incurred unacceptable military risks by our unilateral compliance with the TTBT. As the Department of Energy has correctly testified, "the 150-kiloton limit has constrained our capability to address the full range of developing Soviet threats." Therefore, the Senate should consider very carefully whether or not to give its advice and consent to ratify the TTBT.

EVIDENCE OF DECEPTION BY SOVIET LEADERS IN ARMS CONTROL NEGOTIATIONS

There has long been reliable evidence about the attitude of top Soviet leaders toward compliance with arms control treaties. In May 1972, Soviet leader Brezhnev expressed his private intention to violate the SALT I Interim Agreement by deploying the heavy SS-19 ICBM to replace illegally the light SS-11 ICBM, according to important U.S. intelligence evidence that has been in the public domain since 1976. This evidence as treated in more detail in the Senate floor speech by our distinguished colleague Senator Jim McClure, printed in the Congressional Record on May 25, 1983, on page S 7444, which is reproduced here. This is the best case study available in the public domain of the intentions of the Soviet leadership in regard to arms control compliance. It is printed as appendix II.

SOVIET TTBT COMPLIANCE WOULD BE UNIQUE

There have been over 14 well-documented cases of Soviet negotiating deception in arms control talks. This evidence, plus the confirmed Soviet violations of the SALT treaties themselves, makes it absurd to assume the Soviet leaders would somehow make an exception in the case of the TTBT and refrain from violating it. Indeed, it would be a puzzling anomaly if the Soviets were confirmed to be violating all the existing arms control treaties except the TTBT. But President Reagan has confirmed to Congress that the Soviets have violated every existing arms control treaty. Therefore, those who argue against the certainty of Soviet TTBT violations are asking us to believe that the TTBT is somehow unique among arms control treaties with the Soviets, and that the Soviets for some noble reason refuse to violate it.

III

SALT II TREATY AND TTBT MUST BE CONSIDERED TOGETHER

The SALT II Treaty was hailed when it was signed in June 1979 as an instrument constraining the Soviet first-strike counterforce threat to the U.S. deterrent. This was one of the main selling points used by the SALT sellers.

Yet under SALT II since 1979 the Soviets have added over 4,000 new nuclear warheads, doubling their number of warheads. And most of these new Soviet warheads were on their ICBM force, and were therefore first strike weapons.

As Defense Secretary Weinberger correctly stated, "Even with SALT II constraints, the Soviet Union has built more warheads capable of destroying our missile silos than we had initially predicted they would build even without any SALT II agreement."

Another 2,000 or more Soviet first-strike warheads were added illegally. Each of these 6,000 or more new Soviet warheads was also developed and tested in violation of the TTBT, and many were deployed in violation of SALT II

I was opposed to SALT II in 1979, because I believed it would weaken the U.S. ability to deter nuclear war. I was proven right.

We are much weaker now vis-a-vis the Russians than we were then. The Joint Chiefs of Staff and the Strategic Air Command have both testified that the United States lost strategic parity in 1979 at the very time SALT II was signed. President Reagan has stated at least eight times since 1982 that the U.S.S.R. has achieved strategic superiority over the United States.

I therefore believe that it is quite appropriate for the TTBT and SALT II Treaty to be considered together. They both were intended to constrain the Soviet first-strike counterforce threat, but Soviet violations of both have allowed the Soviets to achieve an overwhelming first-strike counterforce capability.

I therefore will propose to amend the TTBT with the SALT II Treaty, because they are both intended to constrain the Soviet first-strike threat. It is fitting that these two treaties be considered together by the Senate, since both were intended to serve the same purpose. In fact, Dr. Harold Agnew, then director of the Los Alamos National Weapons Laboratory, testified to the committee in the 1977 hearings that in his opinion the TTBT's ratification was directly linked to the success of the then ongong SALT II negotiations. I strongly agree.

Before I propose the SALT II Treaty as an amendment to article I of the TTBT, I would like to outline the fatal flaws of SALT II and the main Soviet SALT II violations.

THE FATAL FLAWS OF SALT II

The SALT II Treaty was voted in December 1979 "not in the national security interest of the United States," by the Senate Armed Services Committee, because it was judged to be "unequal, unbalanced, and destabilizing." History has proven this assessment to be true. The SALT II Treaty expired on December 31, 1985, under its own terms, but the unilateral disarmament bloc in the Congress has been trying to legislate U.S. compliance with this unratified treaty for several years. This attempted legislation of the SALT II Treaty is unconstitutional because it would involve the House of Representatives in a treatymaking matter reserved by the Constitution to the Senate and the President. Moreover, legislating SALT II is also unconstitutional because simple majorities of the Senate and the House would vote on it, but the Constitution says that two-thirds of the Senate must give its advice and consent for the President to ratify a treaty.

On January 28, 1987, our distinguished colleagues Senators Bumpers, Leahy, Heinz, and Chafee introduced the SALT II Sublimit Mutual Compliance Act of 1987, in another attempt to legislate compliance with the unratified, expired, SALT II Treaty. I will show why the fundamental inequities of Salt II and the Soviet violations of it invalidate the proposed act.

What are the fatal flaws of SALT II, which Ronald Reagan campaigned against in 1980?

First, SALT II allowed the Soviets a monopoly in the most dangerous weapon in the world, heavy ICBM's—820 for the Soviets, compared to 0 for the United States.

Second, SALT II allowed the already overwhelming Soviet ICBM first-strike counterforce capability codified in SALT II to grow significantly. The Soviets have legally added over 4,000 intercontinental nuclear warheads to their arsenal since SALT II was signed in 1979, doubling their arsenal of intercontinental warheads. These were mostly first-strike counterforce ICBM warheads. since 1979, the Soviets also added another 2,000 first-strike counterforce ICBM warheads in violation of SALT II.

Third, SALT II allowed the Soviets to keep thousands of stockpiled ICBM's for covert soft launch and rapid-refire, allowing a doubling of the already overwhelming first-strike capability of the Soviet ICBM force.

Fourth, SALT II allowed the Soviets to keep their 275 intercontinental range Backfire bombers outside of SALT II and uncounted in SALT II. These bombers have always had range greater than other bombers on both sides which do count in SALT II, and they can serve as the launch platform for thousands of long range ALCM's.

As Defense Secretary Weinberger correctly stated, "Even with the SALT II constraints, the Soviet Union has built more warheads capable of destroying our missile silos than we initially predicted they would build even without any SALT II agreement."

Beyond these fatal flaws of SALT II, which made the treaty unequal and destabilizing, the Soviets have engaged in systematically violating the most important terms of the treaty. The Soviets had a legal obligation under international law not to defeat the object and purpose of SALT II between June 1979 and September 1981, when both sides were still considering its ratification. After September 1981, when the United States announced its intention not to seek ratification of the treaty, both sides by mutual agreement made a reciprocal political commitment not to "undercut" the treaty as long as the other side showed "equal restraint."

But the Soviets showed no restraint at all, and completely violated SALT II. President Reagan has made five reports to Congress since January 1984, confirming 22 Soviet violations of SALT II, and these reports showed an expanding pattern of Soviet violations. The six most important Soviet SALT II violations are:

(1) Soviet deployment of over 100 SS-25 mobile ICBM's, a prohibited second new type ICBM, which have a prohibited rapid-refire capability doubling the force, and a covert MIRV capability;

(2) Soviet deployment of from 69 to 600 more intercontinental missile launchers and bombers than the Soviets had when they signed SALT II in June 1979, exceeding both of SALT II's overall ceilings on missiles and bombers—2,400 and 2,250. The number of missiles and bombers that the Soviets had in June, 1979—2,504—became the de facto Soviet ceiling in September 1982. And the Soviets are now 69 to 600 above even this ceiling. The United States did not have the right to the same 2,504 Soviet ceiling, further illustrating the fundamental inequalities of SALT II;

(3) Soviet deployment of 5 or more camouflaged SS-24 rail-mobile MIRVed ICBM launchers, without adequate compensatory dismantlement of other MIRVed ICBM launchers, in violation of the SALT II sublimit of 820 MIRVed ICBM launchers;

(4) Soviet production of more than 30 Backfire bombers per year, and deploying Backfires to Arctic staging bases and equipping them with refueling probes, all in violation of the Soviet Backfire Bomber Statement, an integral part of SALT II;

(5) Soviet deployment of 50 to 200 SS-16 mobile ICBM's banned by SALT II;

(6) Excess MIRV fractionation on the SS-18 superheavy ICBM, and the reported flight-testing of an even heavier SS-18 follow-on (the SS-X-26) with even more than the 14 warheads carried by the SS-18 in violation of SALT II.

So it is clear that SALT II is fatally flawed, unequal, destabilizing, and systematically violated by the Soviets. Nevertheless, our distinguished colleagues, Senators Bumpers, Leahy, Chafee, an Heinz, are trying to legislate selectively part of the unratified SALT II Treaty through their SALT II Sublimit Mutual Restraint Act of 1987. The act specifically refers to the "820" sublimit of SALT II on MIRVed ICBM launchers. But it is quite clear that the Soviets have violated this SALT II sublimit of 820 MIRVed ICBM launchers, by their deployment of 5 or more SS-24 railmobile MIRVed ICBM launchers. This violation of the most important SALT II sublimit totally invalidates this proposed legislation.

Those who advocate a U.S. return to compliance with the SALT II Treaty sublimits are asking that the United States comply with SALT II sublimits that the Soviets have exceeded as of early October 1986, well before November 28, 1986, when the United States exceeded a SALT II sublimit as a proportionate response to previous Soviet SALT II violations. A legislative U.S. return to SALT II compliance now, in view of this most recent Soviet SALT II SS-24 sublimit violation, would be nothing less than U.S. unilateral disarmament. Advocacy of renewed U.S. SALT II compliance in the face of 23 Soviet SALT II violations is part of the "Blame America First" syndrome. This is simply appeasement and unilateral disarmament.

COMPLIANCE IS FUNDAMENTAL IN ARMS CONTROL

I agree with the Director of the Arms Control and Disarmament Agency, who stated in July 1981, that: "No arms control agreement can contribute to the goal of a peaceful world unless we have confidence that the Soviet Union is abiding by its terms."

I believe that the best way to keep the peace is through a strong U.S. deterrent force and U.S. enforcement of Soviet compliance with existing arms control treaties. There is Defense and Energy Department testimony to this committee, which I will get into in more detail, that there are unacceptable risks to American national security if we vote to give our advice and consent to ratify the TTBT. Moreover, the Energy Department has testified to this committee that the TTBT has prevented the United States from coping with the Soviet strategic threat by developing and testing our own nuclear deterrent weapons. While the United States has complied with the TTBT, the Soviet violations have allowed them to develop significant military advantages—their first-strike counterforce capability.

All previous U.S. Administrations have announced that if the Soviets were ever caught violating even one provision of one arms control treaty, that we would have to reassess the entire spectrum of our relations with the Soviets. President Reagan has already confirmed an expanding pattern of Soviet arms control treaty violations over the past 3 years, from 7 to 22 now. In the face of this expanding pattern of Soviet arms control violations, is this the time to be voting our advice and consent to a new arms control treaty? To vote to give advice and consent for the President to ratify the TTBT and the SALT II Treaty would be an unprecedented exercise in appeasement of the Soviet Union.

I agree with President Reagan when he stated to the United Nations General Assembly on June 17, 1982, that: "Simply collecting agreements will not bring peace. Agreements genuinely reinforce peace only when they are kept. Otherwise we are building a paper castle that will be blown away by the winds of war."

I believe that President Reagan was correct when he stated last June in regard to our strategic modernization program that "We come now to one of those unique crossroads of history where nations decide their fate * * * our choices are clear" between appeasement and deterrence.

I have long been opposed to both the Threshold Test Ban Treaty an to the Strategic Arms Limitation Treaty II. As I have said, both the TTBT and the SALT II Treaty had the same main purpose, and therefore they should be considered together by the Senate. Both treaties were intended to constrain the Soviet first-strike threat. Both treaties have been unsuccessful in this purpose. Let me first focus on the TTBT in more detail.

THE TTBT ALLOWED SOVIETS TO DEVELOP FIRST STRIKE CAPABILITY

I am opposed to the TTBT in its present form for one simple reason—during the 11-year period since March 1976 when the Soviets were obligated under international law to comply with the 150-kiloton threshold while the TTBT was pending ratification—the Soviets repeatedly violated the TTBT. Moreover, these Soviet violations has a significant military purpose. They enabled the Soviets to develop a first-strike counterforce capability for their ICBM force. Soviet deployment of this Soviet first-strike capability also violated SALT II, and it has seriously degraded the U.S. strategic deterrent forces.

Meanwhile, the United States complied strictly with the TTBT, and this caused the United States to be unable to have confidence in the reliability and the full yield of the warheads for the New U.S. strategic modernization systems. The MX ICBM, the Trident I and II, the ALCM, the ACM, the B-1B all cost several billion dollars each year, so the U.S. unilateral compliance with the TTBT has caused a degradation of our investments as well as our national security.

Thus the U.S. strategic nuclear deterrent has suffered gravely from the TTBT in two ways—first the Soviets have developed the capability to completely destroy most U.S. strategic forces in a first strike, in violation of the TTBT and of SALT II, while at the same time U.S. unilateral compliance with the TTBT has degraded the capabilities of our own already completely vulnerable retaliatory forces.

Thus the TTBT has been dangerous for world peace and international stability, because it has resulted in the grave weakening in two ways of the U.S. stategic nuclear deterrent which has preserved world peace for the past 42 years. And as the Department of Energy testified: "Weakening our nuclear deterrent could make the world safe for conventional war." No one wants either nuclear war or conventional war or chemical war or biological war, and the United States needs to deter all kinds of war with our nuclear weapons.

EFFECTIVE VERIFICATION SHOULD BE AGREED BEFORE SIGNATURE

One thing that the sordid history of the SALT process has taught us is that effective verification measures must be agreed upon as an integral part of the treaty, before it is even signed by the President and before the treaty is submitted to the Senate. This was not done in the case of the TTBT. The following are the current official U.S. verification criteria being used today for the ongoing START or NTS talks in Geneva:

U.S. EFFECTIVE VERIFICATION CRITERIA

(1) The verification provisions must be fully agreed in detail before signature;

(2) The necessary U.S. national technical mans of verification must be in place before treaty limits go into effect;

(3) Equal confidence in compliance must be attained;

(4) Verification must be based upon well-established facts, not theory;

(5) It must be possible to independently confirm relevant data;

(6) Prohibited behavior must be clearly defined and agreed, so as to minimize the possibility of false violations alarms and charges;

(7) The accuracy ot which actions to be limited can be measured must be quantified.

These effective verification criteria go way beyond the existing verification provisions of the TTBT and its protocol. These criteria also go way beyond the administration's own reservation requiring onsite verification by CORRTEX. It is unfortunately too late to add these current verification criteria to the TTBT. And it may even be futile to insist on CORRTEX for effective verification. CORRTEX may be nonnegotiable with the Soviets. I am informed that the Soviets have already, repeatedly, for 5 years, deflected CORRTEX for TBT verification.

One main reason that the Soviets have deflected CORRTEX is that if the United States were allowed to take CORRTEX measurements of a few Soviet tests, such measurements could confirm that the Soviets have long been violating the TTBT.

In sum, I am opposed to the TTBT because we have already adequately verified Soviet violations using our best, agreed official verification methodology, these violations have given the Soviets significant military advantages, and at the same time U.S. compliance has severely degraded the U.S. nuclear deterrent capability. As Admiral Foley testified to the committee, "The 150-kiloton limit has constrained our capability to address the full range of developing Soviet threats."

THE TTBT HAS FAILED IN ITS MAIN PURPOSE: TO PREVENT SOVIET FIRST-STRIKE CAPABILITY

The fundamental purpose of the TTBT was to limit high-yield weapons testing and thereby prevent development of a first-strike counterforce capability. The TTBT has failed in this purpose, because the Soviets have developed an overwhelming first-strike counterforce capability precisely during the 11 years that the 150-kiloton threshold has been in effect. The Soviets have also deployed their first-strike capability in violation of SALT II.

TTBT WOULD LEAD TO CTBT, WEAKENING DETERRENCE OF ALL WARS

Finally, I am opposed to the TTBT in its present form because its ratification would commit the United States to resuming negotiations for a comprehensive test ban treaty (CTBT). The United States relies for deterrence of nuclear war as well as deterrence of conventional war and chemical and biological war, upon our nuclear weapons. We need to test our nuclear weapons and keep them reliable and safe if we are to be able to deter all kinds of wars. This we could not do under a CTBT, and therefore ratification of the TTBT would be a step toward making the world more dangerous. Indeed, ratification of the TTBT could even be a step toward undermining world peace, because I believe the TTBT has already weakened deterrence.

U.S. CANNOT NOW FULFILL ITS DETERRENCE POLICY

Indeed, U.S. strategic nuclear deterrent targeting policy cannot now be fulfilled under the TTBT, and our inability to fulfill our targeting policy will worsen if the United States continues indefinitely to comply with the TTBT.

Presidential Decision 59 and National Security Decision Directive 13 both prescribe a U.S. strategic nuclear targeting policy requiring that Soviet Military targets receive priority. Both documents require that the United States be able to hold Soviet hard military and military-industrial targets, deep underground targets, and relocatable targets, at risk.

But the Soviets are increasing their target hardness and mobility much faster than the United States can develop more capable warheads and delivery systems to keep them at risk. In fact, this was why Dr. Robert Baker, Assistant to the Secretary of Defense for Atomic Energy, testified to the committee that:

> Contrary to the expectations of some in the mid-to-late 1970's, key Soviet military, leadership, and economic assets—which we must be able to hold at risk if deterrence and stability are to be maintained—are increasing significantly in hardness. Hence the U.S. requirement for high-yield weapons has not diminished as some expected in the

> wake of the 1972 ABM Treaty and Interim Agreement on the Limitation of Strategic Offensive Arms [SALT I] * * * [there has been an] incessant Soviet hardening program and their massive buildup in offensive and defensive capabilities since the TTBT was signed in 1974.

Barker added that "we have deployed or will deploy high-yield weapons without full-yeild tests * * * [causing an] erosion of confidence" in the U.S. deterrent. Barker stated further that "if we leave the Soviets free to exploit verification uncertainties to carry out even a few nuclear weapon tests significantly above the 150-kiloton level, we would raise the inherent risk to U.S. security to unacceptable levels * * * and incur unacceptable military risks."

What this means is that continued U.S. compliance with the TTBT would be an "unacceptable risk" to U.S. security, because the Soviets have already achieved significant warhead advantages through their TTBT violations, are never going to agree to CORRTEX, and are not going to stop their violations if we do nothing further toward ratification of the TTBT. What Dr. Barker's testimony means is that we have already incurred unacceptable risks by our unilateral TTBT compliance for the last 11 years.

THE TTBT AND SALT II ARE BOTH DANGEROUS TO U.S. NATIONAL SECURITY

Ronald Reagan stated correctly in 1964, in his famous speech supporting Barry Goldwater, that: "We are at war with the most dangerous enemy that has ever faced mankind." Ronald Reagan was referring to the Soviet Union. I agree with Ronald Reagan about the danger of the threat from the Russians.

SOVIET FOREIGN POLICY: AGGRESSION, DUPLICITY, BLACKMAIL

Before the Senate considers the arms control treaties which are pending, I believe that we must keep in our minds the following unpleasant but true facts about the history of dangerous Soviet international behavior:

> The brutal Soviet invasion of Afghanistan in December 1979, which caused former President Carter to defer the Senate's ratification debate on the Salt II Treaty, has continued relentlessly for the last 7 years, and the Soviets have employed yellow rain and genocidal military tactics in violation of international law, killing and maiming and driving from their homeland millions of innocent Afghan civilians—men, women, and children.
>
> The Soviet leader Brezhnev lied to former President Carter with the Soviet explanation for their invasion of Afghanistan, and on December 31, 1979, Carter stated that Brezhnev's response to the American diplomatic note protesting the Soviet invasion "was obviously false * * * the tone of his message to me was completely inadequate and completely misleading. He is not telling the facts accurately * * * My opinion of the Russians has changed more drastically in the last week * * * this action of the Soviets has made a more dramatic change in my

opinion of what the Soviets' ultimate goals are than anything they've done in the previous time I've been in office."

The Soviets attempted to assassinate Pope John Paul II in June 1981;

The Soviets have attained overwhelming military supremacy over the United States;

The Soviet Foreign Minister Gromyko and Soviet Ambassador to the United States Dobrynin in September and early October 1962 both personally and falsely assured President Kennedy twice that there were no Soviet offensive nuclear missiles in Cuba, reinforcing Soviet leader Khrushcev's equally duplicitous denials;

The Soviet offensive military base and Combat Brigade in Cuba today poses twice the threat to America compared to the threat the Soviets posed in October 1962 at the time of the Cuban Missile Crisis, because there is twice the Soviet nuclear delivery capability present in Cuba today compared to October, 1962, and this Soviet nuclear threat violates the 1962 Kennedy-Khruschev agreement;

The Soviets threatened the United States just after the Cuban Missile Crisis by warning that if ever a future nuclear crisis occurred, they would never again back down, but instead the United States would have to back down, and they have relentlessly built up their strategic forces ever since to a level of overwhelming superiority in order to engage in nuclear blackmail against the United States;

The Soviets are engaging in aggression and subversion in violation of the Monroe Doctrine, which is the fundamental principle of American foreign policy, throughout Central America;

The Soviets have incorporated Angola and Mozambique into their worldwide Communist empire, and are supporting the Communist-dominated African National Congress in its violent revolution against democratic change in South Africa;

The Soviets brutally murdered 269 innocent men, women, and children, including a U.S. Congressman, on Korean Airlines Flight 007 in September 1983, denied their responsibility, and then lied about their deliberate act;

The Soviets shot down KAL-007 because they were in the process of violating the SALT II Treaty on the Kamchatka Peninsula the night that KAL-007 innocently strayed over Kamchatka;

The Soviets violated the 1972 Incidents at Sea Agreement during attempts to recover the KAL-007 black box flight recorder in international seas;

The Soviets are detected, verified, and confirmed by President Reagan to be violating every existing arms control treaty, and the pattern of their SALT violations has been expanding over the past several years;

The Soviets have been confirmed by the U.S. Government to have violated over 250 international security treaties they have signed since the Bolshevik Revolution of 1917;

The Soviets in 1986 imprisoned and threatened the innocent American journalist, Nicolas Daniloff, over false espionage charges;

The Soviets murdered in 1985 American Army Major Nicolson in cold blood in Russian-occupied Communist East Germany;

The Soviets imprison millions of their own people in slave labor Gulag prisons, in violation of their fundamental human rights, in violation of the Helsinki Accords, and in violation of the Soviet constitution itself;

Soviet leader Gorbachev called President Reagan a "madman" and stated that the Reykjavik Summit discussions were "heated" and "sharp," showing that Soviet nuclear blackmail was being subtly employed, especially when Gorbachev stated that international relations are being conducted under the Soviet "law by the fist," and mentioned "unpredictable, serious consequences" in future U.S.-Soviet relations if the United States did not acquiesce in Soviet demands;

The Soviets have violated every summit agreement with the United States since World War II: the Soviets violated the 1945 Yalta Agreement by denying free elections in Poland, and the Soviets violated the 1945 Potsdam Agreement by occupying Eastern Europe;

The Soviets have deployed an overwhelming strategic offensive first-strike capability and an emerging nationwide ABM defense, precisely what the SALT process was intended to prevent, which have together overturned the world strategic balance;

The Soviets mercilessly beat up and drugged in October 1985, Seaman Miroslav Medvid, who sought merely to escape from the Soviet gulag and to achieve freedom, and the KGB forcibly took Miroslav Medvid back to imprisonment or death in the U.S.S.R. in defiance of a legally served U.S. Senate subpoena;

The Soviets are violating the very Litvinov Agreement of 1933, which established Soviet diplomatic relations with the United States, by supporting Communist revolutionary activity within the United States despite their promise not to;

The Soviets in 1977 forged a statement by former President Carter, in 1978 they forged a statement by former Vice President Mondale, and recently they have forged statements by President Reagan, all as part of their post-1976 forgeries offensive, which goes far beyond any disinformation campaigns they engaged in during the harshest days of the cold war;

The Soviets violated the United Nations Charter, through threatened aggression against Poland in 1980 and 1981;

The Soviets violated the 1973 Paris Peace Accords ending the Vietnam war by their continued aggressive buildup of the North Vietnamese Army;

The Soviets deceived the United States and lied to our negotiators in 1972 in the negotiations on each of the main issues of both the SALT I ABM Treaty and SALT I Interim Agreement on offensive weapons, and the Soviets deceived us and lied

> again on each of the main issues in 1979 on the SALT II Treaty.
>
> Virtually the only international "security" treaty which the Soviets have scrupulously complied with was the August 1939 Hitler-Stalin Pact, which caused the outbreak of World War Two and the dismemberment of Poland.

Mr. Chairman, Laurence Beilenson, Ronald Reagan's friend, summed up this whole grisly diplmatic history, when Beilenson said:

> We consider ourselves sagacious in staking our survival on treaties with the U.S.S.R. whose ideology blesses cheating as a virtue.

THE SOVIET APPROACH TO INTERNATIONAL LAW

Soviet leader V.I. Lenin stated that

> Promises are like pie crusts, made to be broken.

And Soviet leader Stalin stated:

> Words have no relation to actions—otherwise what kind of diplomacy is it? Words are one thing, actions another. Good words are a mask for concealment of bad deeds. Sincere diplomacy is no more possible than dry water or wooden iron.

The Soviets use international law, like warfare, subversion, disinformation, and nuclear blackmail, as an instrument of their foreign policy. A Soviet international legal expert wrote succinctly that:

> Those institutions of international law which can facilitate the accomplishment of the stated tasks of Soviet foreign policy are recognized and applied in the U.S.S.R.; those which contradict these aims in any way are rejected.

RATIFICATION OF THE TTBT AND SALT II WOULD BE DANGEROUS APPEASEMENT

The most fundamental American arms control objective since SALT negotiations began in 1969 was to constrain the Soviets from developing and deploying a first-strike counterforce capability. The Threshold Test Ban Treaty (TTBT) and the SALT II Treaty were both designed to constrain the Soviet first-strike capability.

But the Soviets have violated both treaties, in order to deploy their first-strike capability.

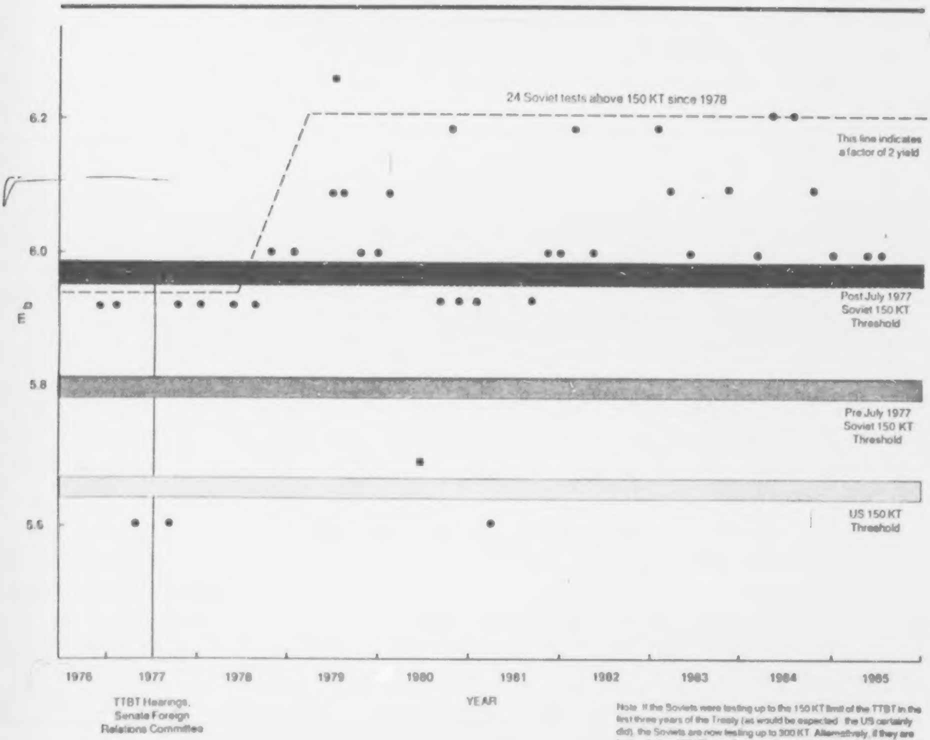
Ratification of the TTBT and the closely related SALT II Treaty would weaken deterrence, and therefore would hurt world peace. The Joint Chiefs of Staff have testified that there are definite risks to American national security if the Senate gives its advice and consent to the ratification of the TTBT and to the SALT II Treaty. The Soviet violations of both have contributed to the Soviet first-strike capability.

Such ratification would be appeasement of Soviet arms control treaty violations.

APPENDIX I

The Sliding Rulers

SOVIET NUCLEAR EXPLOSIONS
(SHAGAN RIVER TEST AREA)
GLOBAL MAGNITUDES (N.E.I.S.) VS TIME



Note: If the Soviets were testing up to the 150 KT limit of the TTBT in the first three years of the Treaty (as would be expected—the US certainly did), the Soviets are now testing up to 300 KT. Alternatively, if they are testing below 150 KT now, they must have restricted testing to below 75 KT during the first 2 1/2 years. This is an unrealistic assumption.

24 Soviet Violations of the Threshold Test Ban Treaty

(By U.S. Senator James A. McClure, January 15, 1987)

The atached Defense Department chart indicates clearly that the Soviet Union has violated the 150 kiloton threshold on underground nuclear weapons testing of the Threshold Test Ban Treaty (TTBT.)

SOVIET LEGAL OBLIGATION

Even though the TTBT, signed in July, 1974, has not been ratified on either the US or the Soviet side, under international law both the US and the USSR are required to do nothing which would defeat its object and purpose, during the period when ratification is still pending. Moreover, in March, 1976, by US-Soviet mutual agreement the 150 kiloton threshold was put into effect as binding on each side. The Soviets have a clear legal obligation to comply with the 150 kiloton threshold. Thus even one Soviet test exceeding the 150 kiloton threshold would defeat the object and purpose of the TTBT, would violate it, and would be militarily irreversible.

THE SOVIET TTBT VIOLATIONS

Both this chart and this analysis, which have recently been updated, are unclassified, according to the Department of Defense and the Arms Control and Disarmament Agency. This is the most complete unclassified description of the official US Government verification assessment of Soviet TTBT violations. It was published in the Congressional Record and in another official US Senate document.

My distinguished colleague, Senator Jesse Helms, requested that the earlier version of this chart be briefed to the Senate Foreign Relations Committee in open session in October, 1983, when the Committee was at that time considering whether to report out the TTBT to the full Senate. After this briefing, the motion to report the TTBT to the Senate Floor was defeated.

The chart shows that there have been 24 Soviet underground nuclear weapons tests since 1978 which are estimated to be above the 150 kiloton threshold, and therefore are violations of the TTBT. There is 95 percent confidence that several Soviet TTBT violations have occurred. Ten Soviet tests reportedly have been at 250 kilotons or above.

In June, 1983, Secretary of State Shultz testified to the Senate Foreign Relations Committee that the Soviets had recently tested a nuclear weapon about "double" the 150 kiloton threshold—at about 300 kilotons. The Defense Department chart indicates that since 1978, the Soviet Union has conducted 6 tests at the 300 kiloton level or higher—at a yield twice that allowed by the TTBT.

Indeed, one Soviet test was reportedly estimated to be over 315 kilotons, and it could have been over 600 kilotons. There is 100 percent confidence, which means certainty, that this test was a TTBT violation.

UNITED STATES METHODOLOGY CHANGES GIVE SOVIET BENEFITS OF EVERY DOUBT

The US has for 12 years given the Soviet Union the benefit of every doubt or uncertainty in TTBT compliance. We have even gone so far as to change our estimating methodology four times since 1974, each time to favor the Soviets by reducing our estimates of their test yields, thereby making their violations under the previous method disappear. Despite this elasticity in US methodology, the Soviets have nevertheless continued to violate the TTBT. This chart shows only one methodology change, which occurred in early July 1977 and which was the most important, and the analysis describes a recent attempt to make a fifth change in Soviet favor.

THE CHART'S VERTICAL AXIS

The vertical axis of the chart is labeled "The Sliding Rulers," showing how the US changed its methodology in early July 1977 to favor the Soviets by making 2 violations disappear. The vertical axis measures "Body Waves" (Mb) from Soviet underground nuclear weapons test at Shagan River (Semipalatinsk), in Central Asia. Body Waves are seismic shock waves which travel on a constant path through the earth's core. This axis is basically a Richter scale.

THE CHART'S HORIZONTAL AXIS

The horizontal axis is time—March 1976, when the TTBT 150 kiloton threshold went into effect, through 1985. The key point in time is late July 1977, when the Senate Foreign Relations Committee first had hearings on the TTBT. The most important methodology change occurred in early July 1977, in order to make 2 Soviet TTBT violations disappear before the hearings began.

THE HORIZONTAL BANDS ARE 150 KT THRESHOLDS

The horizontal bands represent US estimates of 150 kiloton thresholds, based upon various assumptions about the geological characteristics of the Soviet and US testing sites. The upper two bands represent Soviet 150 kiloton thresholds. The center band was the US-estimated Soviet 150 kiloton threshold until 2 Soviet violations began to appear in late 1976 and early 1977. The top band was the new Soviet 150 kiloton threshold, revised upwards in early July 1977 by the US to benefit the Soviets by making the 2 violations disappear. The higher band allows the Soviets ever larger test yields. This band is still the current Soviet threshold using our established methodology. The lowest band is provided merely to illustrate another benefit of the doubt resolved in Soviet favor. It is the US 150 kiloton threshold. It is based upon the known geological characteristics of the US Nevada Test Site. We have allowed the Soviet progressively higher thresholds by making progressively more generous assumptions about the geological characteristics of the Soviet Shagan River-Semipalatinsk test site.

THE SOVIET NUCLEAR TEST PLOTS

Each black dot on the chart represents a Soviet underground nuclear weapon test at Shagan-Semipalatinsk. This unclassified data was provided by the US National Earthquake Information Service, expressed in Body Waves. (Not all Soviet tests are plotted, in order to avoid cluttering the chart.)

THE EARLY JULY 1977 METHODOLOGY CHANGE

Note that according to the Pre-July 1977 Soviet 150 kiloton Threshold band, there had been two Soviet tests higher than this threshold in late 1976-early 1977. These 2 Soviet violations necessitated the changed estimative methodology resulting in the raising of the threshold to the Post-July 1977 Soviet 150 kiloton Threshold. Accordingly, after raising the threshold in Soviet favor to make these 2 violations disappear in early July, the CIA was then able to testify to the Senate Foreign Relations Committee later in July and August, 1977 that there had been no Soviet violations of the TTBT 150 kiloton threshold.

But in late 1978 and 1979, the Soviets again began exceeding even this raised threshold. Moreover, there new excesses were very large.

THE DOTTED LINE—DOUBLING OF SOVIET YIELDS

The dotted line on the chart differentiates tests which have twice the yield of each other. Tests above the dotted line are about twice the yield of tests below the dotted line. Because there are no anomalies except magnitude among Body Waves traveling along the same path through the earth's core, we know with high certainty that tests above the dotted line are twice the yield of tests below the dotted line. This relationship is sound, even though we have uncertainties about the absolute yields of tests.

Thus according to the dotted line, the Soviets doubled the yield of some of their tests in 1979 and thereafter, as compared to 1977. Therefore, if the two highest yields in the 1976-early 1977 period are now estimated to be about 150 kilotons in order for them to be in compliance with the TTBT, then the tests along the dotted line in 1979 and later have to be about 300 kilotons or more, twice the allowed yield.

No credence should be placed in the hypothesis that the Soviets may have cautiously tested at only one half the allowed yield, or at 75 kilotons, between July 1974, when the TTBT was signed, and March 1976, when the 150 kiloton threshold was mutually put into effect. This is because the US itself tested 12 times above 150 kilotons during this period, and the Soviets almost certainly knew this. Moreover, Soviet arms control compliance behavior has always been to exploit all loopholes to their fullest, and to go to the limits of allowed activities and beyond. They have never shown such presumed caution.

CIA ATTEMPTING NEW METHODOLOGY CHANGE TO AGAIN COVER-UP SOVIET VIOLATIONS

Just as the CIA made the 2 1976-early 1977 Soviet violations disappear by raising the Soviet threshold in early July 1977, the CIA is reportedly once again trying to make Soviet TTBT violations disappear. The CIA has reportedly been using a new estimative methodology since January 1986 which makes all but the 12 highest Soviet high yield tests disappear as violations, once again trying to raise the threshold in Soviet favor, for a fifth time.

REAFFIRMATION OF PRESIDENTIAL FINDINGS OF TTBT VIOLATIONS

But the new CIA methodology is inconsistent with other established methodologies and is not accepted by a majority of the Executive Branch components. The early July 1977 methodology remains the current one. While additional studies have been undertaken, their conclusions are incomplete and have not been agreed upon. President Reagan's February and December 1985 Reports to Congress that there have been 21 to 24 Soviet underground nuclear weapons tests which are likely to have violated the 150 kiloton limit of the TTBT have been reaffirmed.

ALL-SOURCE EVIDENCE CONFIRMS SOVIET TTBT VIOLATIONS

Soviet TTBT compliance is not solely a technical problem of analysis of teleseismic data. It is an all-source intelligence and verification problem. Far too much attention has been focused over the years upon the narrowly technical teleseismic evidence of Soviet tests. But other, non-seismic evidence and verification judgments about this evidence may be even more important. For example, one method using direct evidence from non-seismic National Technical Means of verification strongly supports the conclusion that there have been multiple Soviet TTBT violations at high yields. Another example is reported Soviet attempts to deceive US National Technical Means of TTBT verification into underestimating Soviet yields. This phenomenon also offers persuasive evidence of Soviet violations. Finally, even despite Soviet efforts at deception, on two widely separate occassions the Soviets have reportedly made statements which had the effect of confirming their violations, both as to yield magnitude and number of violations. This diplomatic evidence is the most persuasive.

MILITARY SIGNIFICANCE OF SOVIET TTBT VIOLATIONS

Why are the Soviets violating the TTBT? They have good reasons. The TTBT 150 kiloton threshold is militarily significant because it restricts testing the full yields and reliability of new Soviet MIRV warheads which could be used for a first strike capability. According to open sources, most new Soviet ICBM MIRV warheads are estimated to have yields in the 200 to 600 kiloton range. The ten Soviet tests over 250 kilotons therefore could have been scaled or even half yield tests of new warheads for the new 5th and 6th generation Soviet MIRVed ICBMs, such as the SS-24 and SS-X-36 follow-on for the SS-18, both of which are reportedly now being deployed.

The SS-X-26, in flight testing since Spring 1986, before SALT II dissolved, was reportedly recently successfully flight tested. SS-18 silos for it are already reportedly being converted. SALT II had an absolute ceiling on SS-18 follow-on ICBM Throw-Weight. The SS-X-26 follow-on to the SS-18 has even more Throw-Weight than the SS-18. The SS-X-26 reportedly will therefore carry even more warheads than the 14 carried on the super heavy SS-18, already in violation of SALT II. There may even have been several fullyield tests at 500 or 600 kilotons of these new MIRV warheads for the new Soviet ICBMs.

In contrast, the US was severely handicapped in designing and testing warheads for the MX, Trident II, and ALCM by strict compliance with the 150 kiloton threshold. These warheads reportedly have never been tested for reliability at their full yields.

RATIFICATION OF TTBT-PNET IS APPEASEMENT

In sum, it would be an unprecedented exercise in appeasement of the Soviet Union for the US Senate to give its advice and consent for the President to ratify a TTBT which the Soviets are likely to be violating.

Moreover, the TTBT is integrally linked to its companion treaty, the Peaceful Nuclear Explosions Treaty (PNET). The PNET preamble contains language that the US and the USSR reaffirm "their adherance" to the 1963 Limited Test Ban Treaty (LTBT), and they reaffirm "their determination to observe strictly the provisions of these (TTBT and LTBT) international agreements." Beyond his reports of Soviet TTBT violations, President Reagan also reported in February and again in December 1985 that there have been over 30 unambiguous, conclusively confirmed cases of Soviet venting of nuclear radioactive debris beyond their borders from underground nuclear weapons tests, in clear violation of the 1963 Limited Test Ban Treaty. Indeed, reportedly over 50 percent of all Soviet underground nuclear weapons tests have either clearly, probably, or possibly vented radioactive debris beyond Soviet borders in violation of the LTBT.

Thus Senate advice and consent for Presidential ratification of the TTBT and PNET, with its false reaffirmation of Soviet compliance with the TTBT and LTBT, would be totally inconsistent with the likely violations of the TTBT and the conclusively known violations of the LTBT. Such Senate advice and consent would be completely hypocritical. It would also be a grave and dangerous act of American appeasement of the Soviet Union, completely undermining the integrity of the arms control process, and international stability and peace.

The TTBT has been verifiable since 1976. We have verified Soviet violations with high confidence. The problem is not verification, but enforcing Soviet compliance. While the CORRTEX method of direct yield measurement would be a more effective verification method, it will not be a panacea and even it would have uncertainites. Even if the Soviets agree to some form of CORRTEX on site direct measurement verification in the future, their past violations give them irreversible military advantages. These Soviet advantages can not be "grand fathered" away, made to disappear, or ignored.

Instead of asking for Senate advice and consent for his ratification of these two treaties, albeit with a reservation to be negotiated with the Soviets on more effective verification, President Reagan should withdraw these two treaties from the Senate so that he can completely renegotiate the verification and compliance provisions with the Soviets.

APPENDIX II

(This floor statement by Senator McClure was printed in the May 25, 1983 Congressional Record, page No. S 7444.)

DEPLOYING THE MX AS A COUNTERMEASURE AGAINST SOVIET SS-19 HEAVY ICBM DEPLOYMENT CIRCUMVENTING SALT I

Mr. McCLURE. Mr. President, President Reagan recently told the nation that the Soviets have several times more counterforce warheads than the US, and that they can destroy almost all US ICBMs in a first strike. This is the measure of Soviet strategic superiority over the US.

The Defense Department's most recent edition of Soviet Military Power shows that the Soviets have 6,000 ICBM warheads to America's 2,000. So the Soviets have at least three times the ICBM counter force capability of the US.

Another set of facts further accentuates the Soviet counterforce advantage, however. First, the Soviets have far fewer US hard targets to aim at than the US does, and these US hard targets are much softer than most Soviet hard targets. In contrast, the Soviets have over twice as many hard targets as the US, which are on the average three times as hard as US hard targets. Thus it is much more difficult for the US to attack Soviet hard targets than it is for the Soviets to attack US hard targets.

Mr. President, since 1972 when SALT I was signed, the Soviet capability to engage in a counterforce strike against US ICBMs with their own ICBMs has grown by a factor of five or more. Not only do the Soviets have three times the number of ICBM warheads than the US, but on the average, these warheads are more accurate, and about ten times as powerful as each US ICBM warhead. This is the second and more important measure of the Soviet hard target advantage over the US.

The Soviet SS-19 is the most accurate and lethal Soviet ICBM. Since 1974, the SS-19, which carries six MIRVed warheads, began replacing 360 single warhead SS-11s. Since then, the Soviets have increased the number of warheads carried on these 360 SS-11s by a factor of five by deploying 360 six MIRVed SS-19s in their place. Thus in place of 360 small, inaccurate single SS-11 warheads, the Soviets now have 2,160 large yield, highly accurate SS-19 warheads. This is a 500% increase in warhead number alone, a net gain of 1,800 warheads.

Since 1973, the Soviets have developed four versions of the SS-19, each one more lethal than the first, and they are about to flight-test at any time a follow-on to the SS-19 at any time, which will be even more lethal.

In contrast, four years from now in 1987, the US plans to begin deploying 100 MX ICBMs carrying 10 MIRVs each in 100 silos containing Minuteman IIIs with three MIRVs each. The MX force will have 1000 warheads but it will replace a force with 300 warheads, for a net gain of only 700 warheads. Thus the US will be deploying only one third as many warheads with the MX as the Soviets did with their SS-19. And we have already seen that the US needs many more hard target ICBM warheads than the Soviets even to have counterforce parity with them, due to the wide differences in the target sets each side faces and warhead yields and accuracies. The planned US MX deployment is only about a two fold increase in the number of US hard target warheads, compared to the five fold increase for the Soviets that their SS-19 represents. It is a four fold increase in throw-weight, and at least a ten fold increase in megatonnage.

THE U.S. MX IS THE EQUIVALENT OF THE SOVIET SS-19

The US MX ICBM was designed to have the same throw-weight as the Soviet heavy SS-19 ICBM. The MX is thus the equivalent to the heavy Soviet SS-19 in many ways, except that the SS-19 has been deployed since 1974, and the MX may not be deployed until 1987, over 13 years later. One reason for deploying the MX that is rarely recognized is the fact that the Soviets deceived the US *three times* regarding the heavy SS-19 MX equivalent in SALT I and SALT II. Moreover, the Soviet heavy SS-19 MX equivalent violates or circumvents SALT I.

Dr. Henry Kissinger warned Congress on June 15, 1972:

> The possibility always exists that the Soviets will treat the Moscow [SALT I] Agreements as they have sometimes treated earlier ones, as just another tactical opportunity in the protracted conflict. *If this happens, the United States will have to respond* . . . If this agreement were being *circumvented,* obviously we would have to take *compensatory steps* in the strategic field. (Emphasis added.)

During the decade since SALT I, the Soviets have in fact both circumvented and violated both the SALT I interim Agreement and the SALT I ABM Treaty. Today they are also violating the SALT II Treaty, just as they violated most treaties between 1917 and 1962. But the US has yet to take compensatory countermeasures, as Dr. Kissinger pledged.

One important countermeasure against further Soviet SALT violations is deployment of the MX, which is the equivalent to the notorious Soviet SS-19.

Mr. President, it is necessary for me to remind the Senate of the grisly history of the Soviet SS-19, as we debate the deployment of its American equivalent, the MX.

The Senate Intelligence Committee report of October 1979 on the verifiability of the SALT II Treaty stated in retrospect that:

> The Soviet's unanticipated ability to emplace the much larger SS-19 in a slightly enlarged SS-11 silo *circumvented* the safeguards the United States thought it had obtained in SALT I against the substitution of heavy for light ICBMs. (Emphasis added.)

SOVIET SS-19 DECEPTION

It has long been clear that the Soviets engaged in negotiating deception in May 1972 on the key issue of SALT I—heavy ICBM deployment. After successfully fooling the US into signing a grossly disadvantageous SALT I Interim Agreement, the Soviets then went on to circumvent the agreement by deploying their heavy SS-19 ICBM.

In SALT I, the US gave up entirely its superior ABM capability for worse than nothing—a fivefold increase in the very Soviet offensive capability our ABM was designed to defend against.

What did SALT I say about Soviet deployment of heavy ICBMs? Article II of the SALT I Agreement stated:

> The Parties undertake not to convert land-based launchers for *light ICBMs* or for ICBMs of older types deployed prior to 1964, into land-based launchers for *heavy ICBMs* of types deployed after that time. (Emphasis added.)

As can readily be seen, in order to constitute an effective constraint, this provision calls for a definition of a "heavy ICBM." But unknown to the US in May 1972, the Soviet SS-19 ICBM was indeed a heavy ICBM, both by the US definition, and more significantly, also by the Soviet's own definition. Moreover, the Soviets in May 1972 also had secret plans to deploy the heavy SS-19 very widely as the main replacement for their light SS-11 ICBM. Thus in May 1972, the Soviet leadership faced a severe negotiating problem. How could they agree to Article II while still deploying the heavy SS-19?

Mr. President, one way that the Soviets could do so was not to agree to the required definition of a heavy ICBM, thus rendering SALT I's Article II ineffectual.

This is exactly what happened. No agreement was reached on a definition of a heavy ICBM, leaving a large loophole in the provision designed to deal with the most important US goal in SALT I: Constraints on Soviet heavy ICBMs. The US finally was forced to offer the following Unilateral Statement on May 26, 1972:

> The US Delegation regrets that the Soviet Delegation has not been willing to agree on a common definition of a heavy missile. Under these circumstances, the US delegation believes it necessary to state the following: *The United States would consider any ICBM having a volume significantly greater than that of the largest light ICBM now operational on either side to be a heavy ICBM.* The US proceeds on the premise that the Soviet side will give due account to this consideration. (Emphasis added.)

Mr. President, at the May 1972 Summit meeting in Moscow where SALT I was resolved, the top Soviet political and military leaders used negotiating deception to mislead President Nixon and Henry Kissinger about their heavy SS-19 ICBM.

On the heavy ICBM issue, the diplomatic record clearly indicates that Soviet negotiators, including the late Soviet President Leonid Brezhnev himself, engaged in negotiating deception on the Soviet SS-19 heavy ICBM. Brezhnev and other Soviet negotiators made many false statements from 1971 to May 1972 which had the intended effect of misleading the US about the size of their then-secret new large ICBM, the heavy SS-19.

Indeed, there is evidence that the Soviets themselves considered the SS-19 to be a heavy ICBM, which it certainly was by US standards. But in May 1972, only the Soviets knew of the existence and size of the heavy SS-19.

Mr. President, the Soviet leaders argued falsely that an agreed definition of a heavy ICBM was unnecessary.

Their most significant deception was their many false statements during the negotiations that they did not intend to replace light ICBMs (the SS-11) with heavy ICBMs. This turned out to be precisely the opposite of their plans, as confirmed by events, and completely contrary to Article II of SALT I. As noted, Article II prohibits just such replacement of light ICBMs with heavy ICBMs.

The Soviets also claimed quite falsely that both sides already knew which ICBMs were heavy, when in fact only the Soviets knew about the SS-19 and its heavy size.

The Soviets went on to argue falsely that this understanding of what ICBMs were heavy would not change during the five year term of SALT I. Of course, the Soviets knew it would take the US several years to determine the large size and heavy throw-weight of their SS-19.

The Soviets actually argued several times that the US could "trust" them not to convert light ICBMs into heavy ICBMs.

In order to further deflect US concerns about heavy ICBMs replacing light ones, the Soviets also suggested that it might be possible to ban a missile like the SS-19 turned out to be, even as they were planning to deploy such a missile widely as the main replacement for their light SS-11. When the US expressed interest in such a ban, they quietly dropped their proposal, which had already achieved its purpose of stimulating US complacency about real Soviet heavy ICBM intentions.

Finally, the Soviets also deceptively bargained to successfully persuade the US to abandon attempts to gain an agreed definition of a heavy ICBM. They did this by arguing that a heavy ICBM definition was superfluous and then by linking resolution of this issue on their terms to resolution of other issues.

The Soviet heavy SS-19 was first test-fired to long range in 1973, and it took the US until 1975 to determine its characteristics. By then, SALT I only had two years until its expiration.

Mr. President, the heavy SS-19 turned out to be 400 percent heavier in throw-weight than the light SS-11, and its volume is about 50 to 60 percent greater than the small SS-11. The deployment of the heavy SS-19 helped to quintuple the Soviet counterforce threat to the US by the time of SALT I's expiration in 1977. Even the Carter Administration conceded publicly that the heavy SS-19 was even more deadly than the super-heavy SS-18, because of the SS-19's enhanced accuracy and larger deployment. There are 326 SS-18s deployed, but 360 SS-19s deployed.

OTHER EVIDENCE OF SS-19 DECEPTION

In addition to the diplomatic record, there is important intelligence evidence indicating Soviet deception on the SS-19. This evidence was acquired in 1972. Congressman Jack Kemp has described this evidence in the Congressional Record, citing William Beecher's article in the Boston Globe of October 10, 1976 entitled "United States May Reply to Soviet Rays".

According to Beecher, the United States eavesdropped on Soviet communications in Moscow in May 1972, during the SALT I negotiations. According to the Congressional Record and to Beecher:

> In May 1972, in the hours immediately preceding agreement on the SALT I pact in Moscow, a conversation was intercepted in which Soviet Party Chairman Leonid Brezhnev checked with a top weapons expert to get assurance that an about-to-be concluded formula covering permissible silo expansion would allow the Soviets to deploy a *bigger* new missile then under development. That intercept provided the first solid information that the SS-19, as it is now known, was destined to replace some of the relatively small SS-11 missiles, which comprise the bulk of the Soviet ICBM force. The SS-19 has three to four times the throw-weight of the old missile." (Emphasis added. Congressional Record, August 2, 1972, p. E 4076.)

There is another description of this evidence. As William Safire wrote in The New York Times of August 6, 1981 ("Deception Managers," page A-23):

> The first inkling of duplicity came to us in May, 1972, via "Gamma Gupy," our tuning in to limousine telephone conversations between Leonid Brezhnev, Andrei Gromyko, and Soviet missile designers at the Moscow Summit Conference. These transcripts quoted Mr. Brezhnev talking about a "main missile" that had never been mentioned in SALT negotiations, which turned out to be the SS-19. The surprised Henry Kissinger considered this "sharp practice".

Mr. President, this highly significant intercept occurred on May 26, 1972, just before SALT I was signed. It indicated that the then secret SS-19 was a large, heavy ICBM. Moreover, this intercept also indicated that Brezhnev himself intended the heavy SS-19 to replace the light SS-11 on a large scale. This was precisely what Article II prohibited. Yet Brezhnev and the other top Soviet negotiators repeatedly told US negotiators that the USSR did not intend to replace light ICBMs with heavy ICBMs. Indeed, Soviet negotiators told US negotiators that the US could "trust" the Soviets not to replace light ICBMs with heavy ICBMs.

Thus this intercept conclusively confirms Brezhnev's negotiating deception on their heavy SS-19. Brezhnev knew that the heavy SS-19 would violate or circumvent Article II's prohibition of heavy ICBMs replacing light ICBMs, but he also knew that in May 1972 the US did not then know about the heavy SS-19.

But Brezhnev was cleverly disingenuous about his SALT I negotiating deception at the time of the May 1972 Moscow SALT I Summit. President Nixon, a direct victim of Brezhnev's duplicity on the SS-19, reports that Brezhnev told him then:

> If we are trying to trick one another, why do we need a piece of paper? We are playing clean on our side. The approach of "catching each other out" is quite inadmissible.

CONFIRMATION OF SOVIET SS-19 DECEPTION IN SALT I

Former SALT I negotiator Gerard Smith, former Defense Secretary James Schlesinger, former Defense Secretary Melvin Laird, former Secretary of State Henry Kissinger, former President Richard Nixon, the leading critic of SALT, Senator Henry Jackson, and even 1976 Presidential Candidate Jimmy Carter have all confirmed that the US was deceived by the Soviets on the heavy SS-19, the key issue of SALT I by all accounts. This negotiating deception in turn constitutes either a violation or a circumvention of SALT I.

Gerard Smith testified to the Senate Armed Services Committee in July, 1972:

> If they [the Soviets] tried to deploy in SS-11 holes a missile substantially larger in volume than the SS-11, that would be considered a heavy missile * * * and would be a *violation* * * * We will have to look at what comes along [in new Soviet ICBMs] * * * We have put them on clear notice that any missile having a volume significantly larger than their SS-11, we will consider that as *incompatible* with the Interim Agreement. (Emphasis added.)

Former Defense Secretary Schlesinger conceded two years later, in March 1974:

> What we were *unprepared for* was the enormous expansion of Soviet throw-weight represented by the SS-X-19 as the potential replacement for the SS-11 * * * the SS-17 and SS-19 can no longer be treated as light missiles * * * [the] breadth, depth, and momentum [of the Soviet strategic R&D program] *as now revealed* come as something of a *surprise* to us * * * subsequent to the signing of the [SALT I] agreement, we see a Soviet research and development program of *astonishing* breadth and depth * * * Many people, particularly people in the arms control community, have been *surprised* by the strength of those programs. (Emphasis added.)

Former Defense Secretary Laird explicitly charged in December 1974:

> There is no question that if * * * SS-X-19 missile deployment will go forward in 1975 with a volume of 50 percent greater than the SS-11, such deployment would be in *violation* of the 1972 [SALT I] Interim Agreement. (Emphasis added.)

Mr. President, the distinction between SALT negotiating deception, circumvention, and violation is difficult for most observers to make, partly because the SALT provision, Article II, is imprecise and ambiguous without definitions of light and heavy ICBMs. The deception in the case of the heavy SS–19, however, was deliberately intended by the Soviets.

According to Dr. Henry Kissinger's authorative biographers, Marvin and Bernard Kalb, Kissinger himself understood Soviet negotiating strategy in SALT even before the negotiations began in 1969. Kissinger believed then that Soviet strategy "would be to engage in arms talks to lull the Americans into a false sense of security."

On June 15, 1972, Dr. Kissinger tried to synthesize the agreed wording of Article II with the US Unilateral definition of a heavy ICBM. Thus he made a US Unilateral Statement appear to be binding upon the Soviets. Kissinger told Senators and Congressmen at the White House:

> First, there is the *safeguard* that no missile *larger* than the heaviest light missile that now exists can be substituted * * * As far as the break between the light and heavy missiles is concerned, we believe we have *assurances* * * * (Emphasis added.)

Kissinger did not specify the Soviet "assurances," but they presumably were the many Soviet statements that the US could "trust" them not to convert light ICBMs into heavy ICBMs, and the many Soviet pledges that they did not plan to do so.

Mr. President, this June 15, 1972 Kissinger policy statement is wholly inconsistent with the evidence of Brezhnev's May, 1972 deception as described in the Beecher and Safire accounts of the communications intercept above. Serious questions about the dissemination and analysis of intelligence in June 1972 are therefore raised by this inconsistency. Several published accounts of this problem suggest that key intelligence evidence was suppressed. Eugen V. Rostow stated in 1979:

> Kissinger's policy was that the facts about Soviet power and policy of expansion must be "concealed" from the American people while the government negotiates the "best deal it can get."

Kissinger later made four admissions, however. He himself evidently was "lulled" by the Soviets, and their "assurances" turned out to be completely deceptive.

First, on December 9, 1975, Kissinger stated that:

> We obviously did not know in 1972 what missiles the Soviet Union would be testing in 1974 * * *

More explicitly, Kissinger openly acknowledged on August 12, 1979, on national television:

> What we did not understand at the time [May, 1972] and on which we had no evidence whatever at the time, because it didn't exist, was that the Soviet Union would construct a missile [the SS–19] which was sort of half way between the SS–11 and the SS–9 * * * *It was simply our lack of knowledge that such a missile existed or could be built* * * * I would call it [Soviet deployment of the SS–19 after SALT I was signed] *sharp practice.* (Emphasis added.)

"Sharp practice" in SALT negotiation on the most important issue of SALT I—heavy ICBMs—must be regarded as Soviet negotiating deception. It also represents Soviet violation or circumvention of SALT I as it was explained to the Congress and to the American people.

Kissinger also testified to the Senate Foreign Relations Committee in 1979 that in SALT I:

> We resorted to [Unilateral Statements] ourselves to perhaps an excessive degree in 1972, and in speaking to a group of Congressmen in the White House at the time [on June 15, 1972], *I mentioned unilateral statements that we had made as a restraint on Soviet conduct.* I think experience has shown that the unilateral statements that we have made are *not a restraint on Soviet conduct,* that they do not bind the Soviet Union. (Emphasis added.)

This is a quite remarkable retraction by Kissinger of his 1972 attempt to synthesize Article II and the US Unilateral statement defining a heavy ICBM.

Finally on August 12, 1979, Kissinger also confessed on national television:

> I think the Soviets have pressed against the legal limits of SALT I.

Thus even to Kissinger, SALT I's greatest apologist, the Soviets have come close to violating SALT I, possibly circumventing SALT I in their "sharp practice." But Kissinger also said in 1972 that if SALT I was circumvented by the Soviets, or exploited as a tactical opportunity in the protracted conflict, the US would have to deploy compensating strategic programs. This we have not done, despite the clearcut Soviet circumventions of the SALT I Interim agreement and ABM Treaty.

Most authoratively of all, we now have former President Nixon's statement made in 1980:

> First they [the Soviets] try to *deceive* us, in order to disguise their intentions and make us relax our will * * * in some cases, such as substitution of heavy SS-17 and SS-19 ICBMs for the light SS-11s, Soviet force modernization exploited loopholes in the SALT I Agreement *contrary to our understanding of that agreement.* (Emphasis added.)

Such a fundamental US misunderstanding of the terms of SALT I constitutes conclusive confirmation of Soviet negotiating deception and circumvention or violation of SALT I.

Senator Henry Jackson also confirmed Soviet SALT I deception on June 28, 1976, in a very telling statement:

> My interpretation [in 1972] as to what the Soviets could do with the SS-11 turned out to be absolutely true. [Jackson predicted in 1972 that the Soviets would replace the light SS-11 with a heavy ICBM as large as the SS-19.] And what the understanding was on the part of the President's representatives was contrary to that. And as you know, Secretary Laird has said that it is a complete *violation* of the understanding that they [the Nixon Administration]

> had * * * *We [the Senate] were lied to in SALT I* * * * *We were lied to by the Secretary, the now Secretary of State Kissinger* * * * It turned out that the things we predicted were right * * * Secretary of Defense Melvin Laird has since corroborated it, that they [the Nixon Administration] were *misled* [by the Soviets]. (Emphasis added.)

1976 Presidential Candidate Jimmy Carter himself even recognized that in general the Soviets had deceived the US in SALT I. During the 1976 campaign he stated that:

> In many instances we've been out-traded by the Soviet Union,

And Candidate Carter asserted that he would be:

> Much tougher in negotiations.

But this did not prove to be the case in his own resolution of the SS-19 ICBM issue in SALT II.

In an interview in *Conservative Digest* published in November, 1981, former Director of the Arms Control Agency, Professor Eugene Rostow, was asked if he believed the Soviets engaged in negotiating deception in SALT. Rostow answered:

> In SALT I, they [the Soviets] certainly did [engage in negotiating deception].

The heavy SS-19 was the key issue of SALT I, and Brezhnev himself played an important role in negotiating on this and all issues of SALT I. As a former top CIA official, Cord Meyer, wrote in 1980:

> The Soviets in the SALT I negotiations succeeded in winning crucial advantages by hard bargaining and by the *deliberate concealment* of the fact that *new types* of ICBMs were ready for testing. (Emphasis added.)

The Reagan Administration even regards the heavy SS-19 to be a large ICBM. In The United States Budget In Brief for Fiscal Year 1983, the Administration declares on page 34 that the US is developing a "new large ICBM, the MX." The MX was explicitly designed to have the same throw-weight as the Soviet SS-19. Thus if the MX is a large ICBM, it follows that its counterpart the SS-19, is also a large ICBM. But the Carter Adminstration, like the Nixon-Ford Administration before it, insisted on calling the heavy SS-19 a "light" ICBM. And recall that for years after 1972, US Intelligence continuously tried to insist that the SS-19 was a "new small ICBM" for deployment in "new small silos."

SOVIETS DECEIVE US THREE TIMES ON HEAVY SS-19

Mr. President, the Soviets deceived the US twice more on their heavy SS-19, for a total of three times. SALT I's Articele II was preserved in the November 1974 Vladivostok SALT II accord, but again without an agreed definition of a heavy ICBM. The Vladivostok Accord, in turn was the basis for the SALT II Treaty, and Article II was thus carried forward into SALT II unchanged, for a total three times that the US was deceived by the Soviets on their heavy

SS-19 ICBM. The Soviets deceived the US on the SS-19 in 1972, 1974, and 1979.

As Winston Churchill stated in his recent book, "Defending the West":

> The naivete of Western governments and negotiators was matched only by the calculating cynicism of their Soviet counterparts. No sooner was the SALT I agreement signed than the Kremlin launched a test program of an entire new generation of four ICBM systems * * * This massive strategic buildup was to give the Soviet Union * * * strategic superiority over the United States * * * Henry Kissinger and Cyrus Vance were babes in arms when it came to dealing with the Russians, and Kissinger had the frankness to admit as much.

Mr. President, I believe that the history of the Soviet equivalent to the MX, the heavy SS-19, has great relevance to the Congress as we vote on whether to deploy the MX. The Soviets have resorted to negotiation deception and circumvention or violation of SALT I in order to deploy their MX equivalent. They may also violate SALT II again when they flight-test their successor to the SS-19. The US needs to deploy the MX as a minimal response to this dismal history.

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